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Report No. 79-070  
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FINAL REPORT  
DIGITAL ULTRASONIC SIGNAL PROCESSING:  
PRIMARY ULTRASONICS TASK  
AND TRANSDUCER CHARACTERIZATION  
USE AND DETAILED DESCRIPTION

(NASA-CR-161370) DIGITAL ULTRASONIC SIGNAL N80-16356  
PROCESSING: PRIMARY ULTRASONICS TASK AND  
TRANSDUCER CHARACTERIZATION USE AND DETAILED  
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Marshall Space Flight Center, Alabama 35812



**M&S** COMPUTING, INC.

## PREFACE

The Digital Ultrasonics Systems Use and System Description Manual provides a detailed description of the use of the Primary Ultrasonics Task (PUT) and the Transducer Characterization System (XC) for the collection, processing and recording of data received from a pulse-echo ultrasonic system. PUT and XC were developed for NASA at Marshall Space Flight Center (Contract No. NAS8-33100) to collect and process Ultrasonic signal data for NASA analysts.

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## 1. INTRODUCTION

The interactive ultrasonic data acquisition and display systems described herein have been developed by M&S Computing, Inc., Huntsville, Alabama, for the National Aeronautics and Space Administration (NASA) Non-Destructive Testing Laboratory located at the George C. Marshall Space Flight Center in Huntsville, Alabama, under Contract NAS8-33100.

This software is supported by the hardware configuration shown in Figure 1-1, executing on Digital Equipment Corporation (DEC) PDP-11/45 and LSI-11 processors which are both running under the RT-11 single job operating system, version 2C-02 (RT-11SJ V02C-02). The Tektronix graphics terminal provides extensive operator interaction with input, and modifies parameters controlling the system's performance. In addition, the high resolution random-scan graphic capability is utilized to produce a variety of meaningful displays. The Elsytek array processor is used to produce forward and inverse Fourier transforms of all or part of the signal data. The Biomation waveform recorder is used to record the signal from the ultrasonic transducer at rates up to 100 MHz. The LSI-11 processor controls the scanner through the scanner controller, provides trigger signals for the ultrasonic pulser and communicates with the 11/45 through a DR-11C interface.

The two systems described in this document include five primary functions common to many real-time data acquisition systems. Some of these functions are implemented using the same code in both systems. These five functions are:

1. Solicitation and acceptance of operator control input.
2. Acquisition of data.
3. Screening of data for further processing.
4. Processing of data or recording of data for post processing.
5. Generation of displays of raw and processed data.

Since the last four functions listed above are dependent on the first to a large degree, a description of the use of the control inputs, supplemented by an explanation of those operations not under user control, is sufficient to describe the use of the system. This approach will be followed in the two sections of this document which are concerned with instructions to the user.

# HARDWARE CONFIGURATION

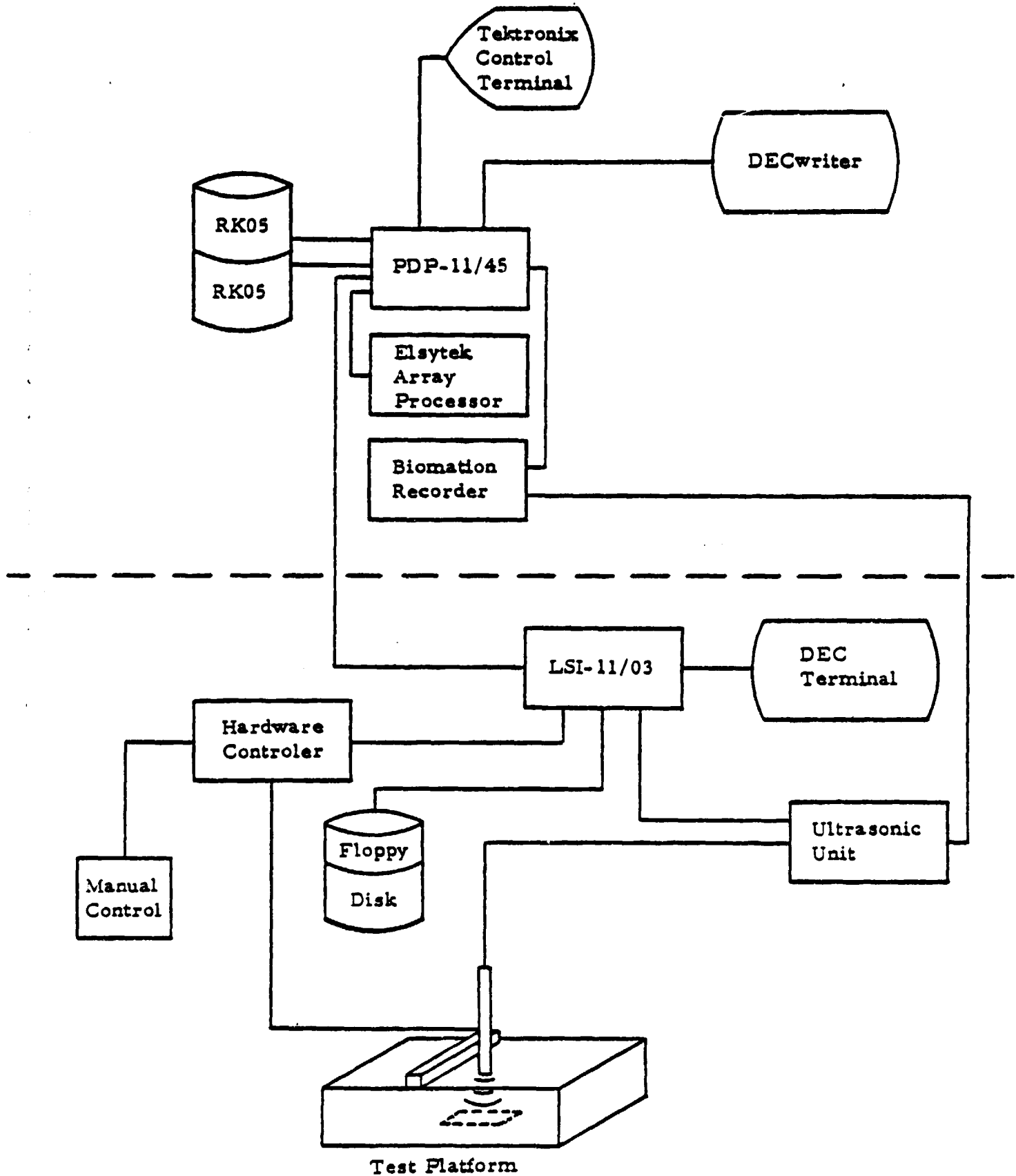


Figure 1-1

## 2. USE OF PRIMARY ULTRASONICS TASK (PUT)

PUT provides the capability to acquire, process and display ultrasonic echo data in a variety of ways. Using this system, the operator can:

- Perform an X-, Y-scan of a specimen in the test tank.
- Place and delete "Time Windows" to select particular portions of the data for special processing during a scan.
- Select a subregion of a displayed scan to be rescanned at higher resolution.
- Select a point within a displayed scan or subscan to position the ultrasonic probe for detailed signal analysis.
- Display all or part of the returned raw signal data.
- Calculate and display all or part of the FFT of a selected portion of the ultrasonic signal.
- Perform digital filtering of the FFT with up to eight frequency windows.
- Calculate and display the inverse FFT.
- Perform signal averaging up to 99 frames of data.
- Compress and record on disk a selected portion of the signal data contingent upon tripping of an alarm window in the signal data.

When MNS is executed on the PDP-11/45, the PUT control display will appear on the Tektronix terminal. From this terminal, the operator may select any of the control options, (SCAN, DISPLAY, ZOOM, etc.) at any time by typing the appropriate character. The following are the control options currently available:

- S = SCAN - Set up data acquisition.
- D = DISPLAY - Select calculations and output.
- A = AVERAGE - Multiple frames of input data.
- Z = ZOOM - Adjust delay, sample internal and display limits for signal.
- W = WINDOW - Place time or frequency windows.

X = EXAMINE FFT - Adjust display limits on FFT.

T = TRIGGER - Set trigger criteria for Biomation.

V = VIEW - Select subscan or point scan from an existing threshold plot.

R = RECORD - Set up data recording

E = EXIT - Terminate MNS.

P = PAUSE - Hold current display.

G = GO - Continue processing after pause or from control display.

## 2.1 TRIGGER Control

When the Biomation Digital Recorder is under control of the PUT System, the front panel switches in the trigger section of the Recorder are disabled. This section is under digital control and may be accessed by the operator by pressing "T" on the control terminal.

When TRIGGER control is thus requested, the operator is prompted to select values for five parameters: Trigger Source, Trigger Slope, Trigger Coupling, Trigger Level Polarity, and Trigger Level.

The following example reflects the necessary trigger set-up for the hardware configuration described in this manual.

```

T
TRIGGER CONTROL REQUESTED
SELECT TRIGGER SOURCE
0 = EXTERNAL
1 = INTERNAL

1
SELECT TRIGGER SLOPE
0 = NEGATIVE
1 = POSITIVE

0
SELECT TRIGGER COUPLING
0 = DC
1 = AC

0
SELECT TRIGGER LEVEL POLARITY
0 = NEGATIVE
1 = POSITIVE

1
KEY IN 2-DIGIT TRIGGER LEVEL 9 0.

```

# EXAMPLE DEMONSTRATING THE USE OF ZOOM

POSITION CURSOR OVER POINT OF INTEREST

ENTER "1" TO ZOOM IN

ENTER "0" TO ZOOM OUT

PRESS RETURN TO LEAVE ZOOM MODE

R A H D A T A

.05 VOLT.  
0000 DELAY

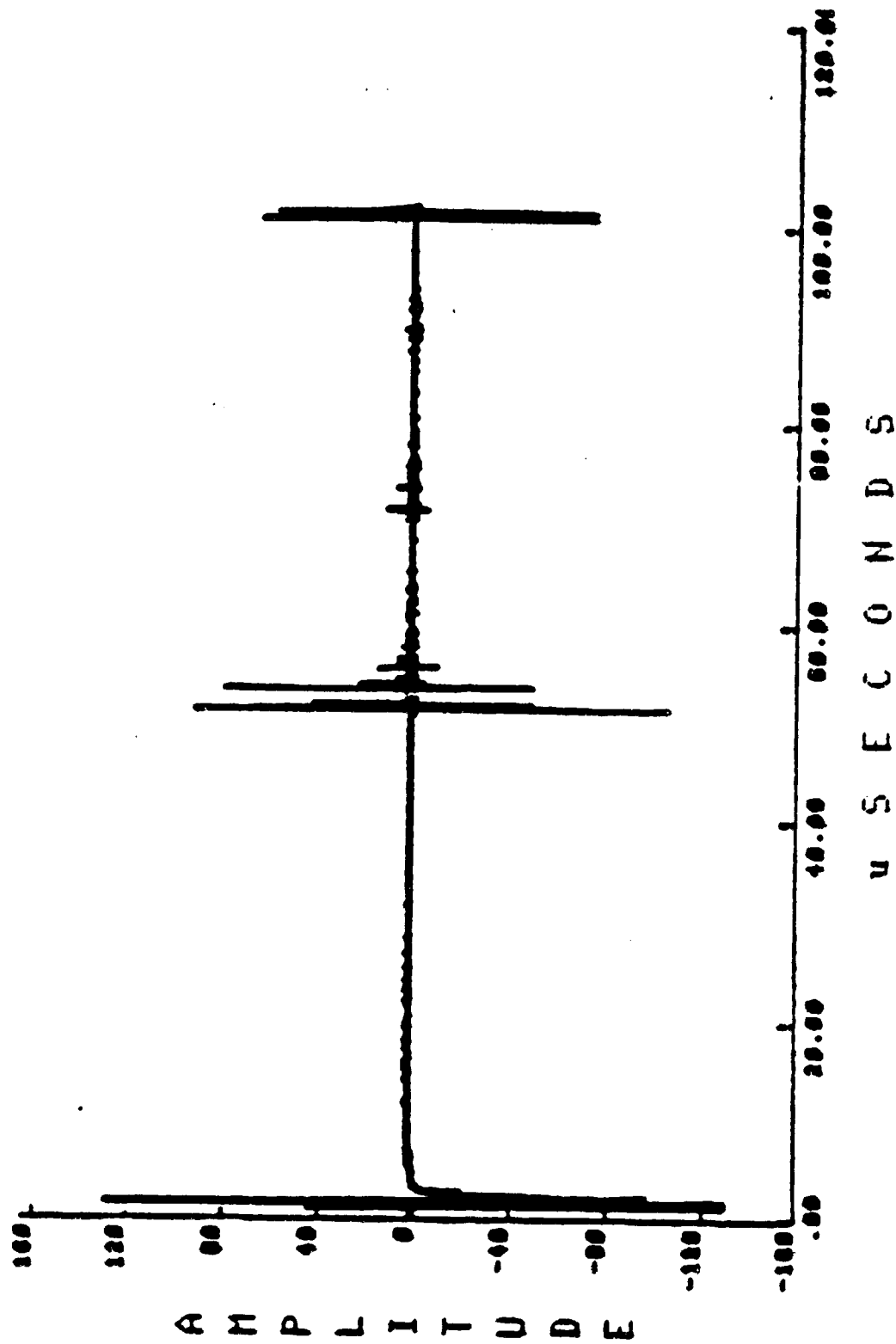


Figure 2-1

# EXAMPLE DEMONSTRATING THE USE OF ZOOM

POSITION CURSOR OVER POINT OF INTEREST

ENTER "1" TO ZOOM IN

ENTER "0" TO ZOOM OUT

PRESS RETURN TO LEAVE ZOOM MODE

.02 uSEC.  
1040 DELAY

R A H D A T A

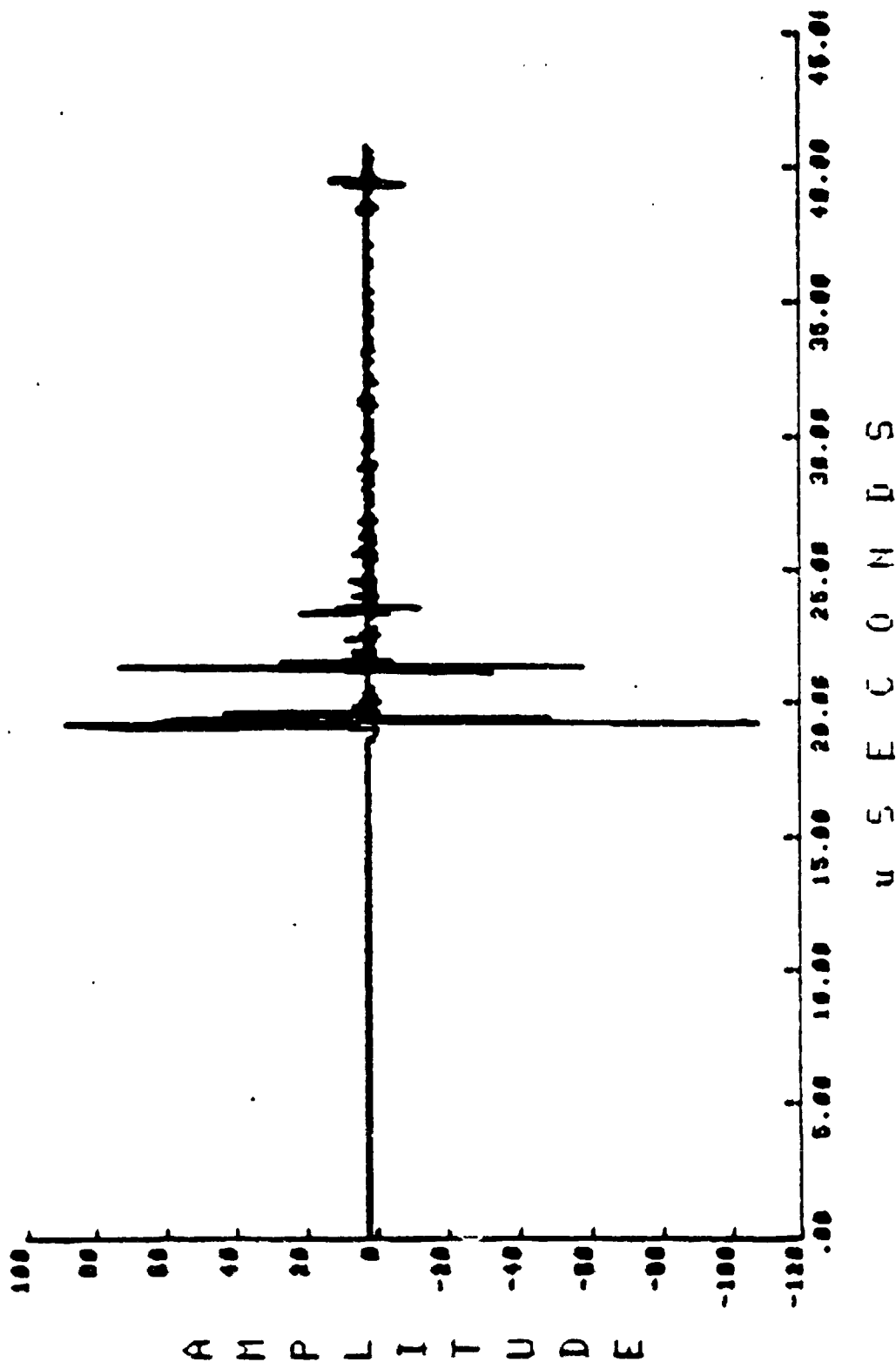


Figure 2-2

# EXAMPLE DEMONSTRATING THE USE OF ZOOM

POSITION CURSOR OVER POINT OF INTEREST

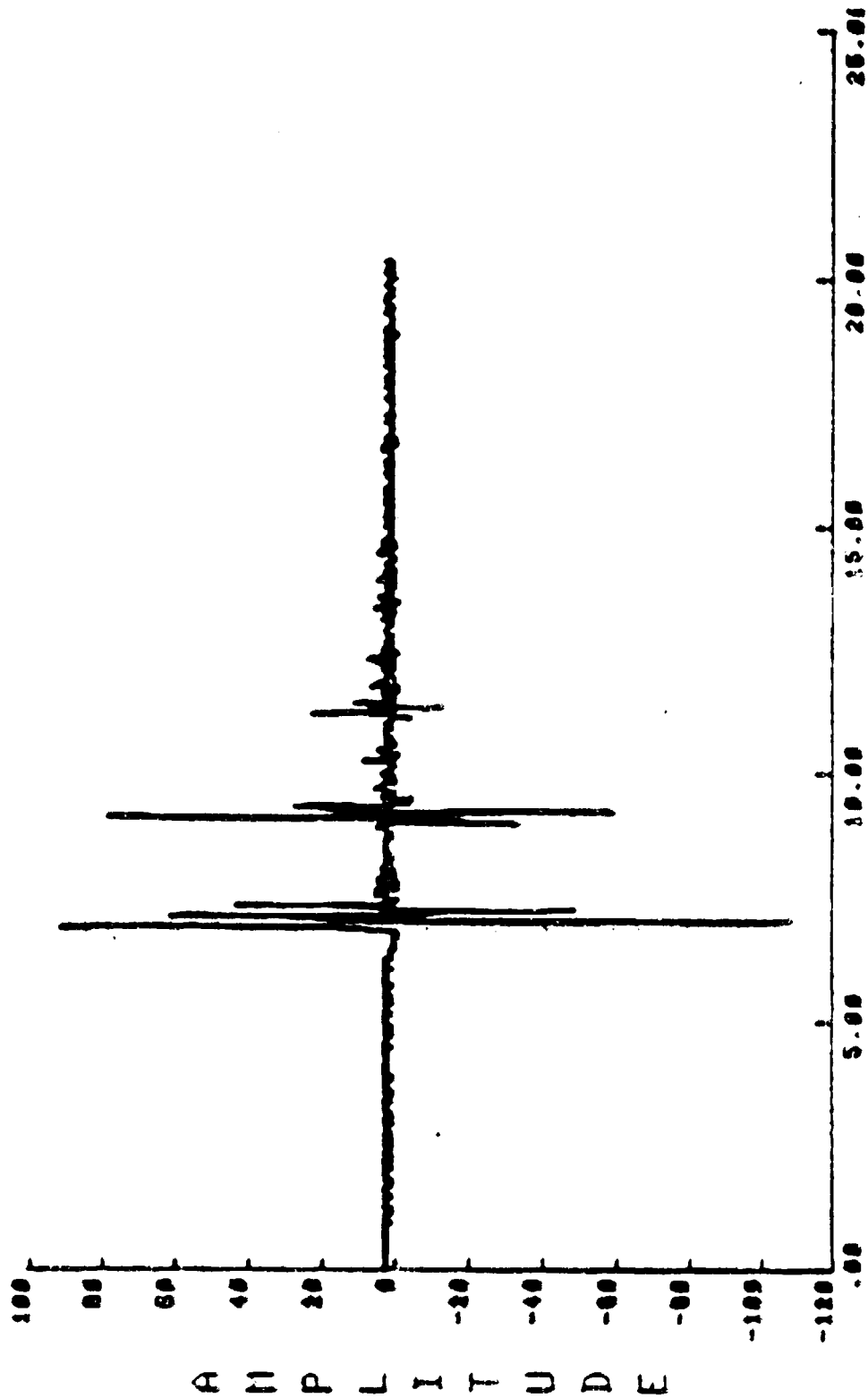
ENTER "I" TO ZOOM IN

ENTER "O" TO ZOOM OUT

PRESS RETURN TO LEAVE ZOOM MODE

.01 USEC.  
4270 DELAY

R A I I D A T A



U S E C O N D S

Figure 2-3

# EXAMPLE DEMONSTRATING THE USE OF ZOOM

POSITION CURSOR OVER POINT OF INTEREST

ENTER "I" TO ZOOM IN

ENTER "O" TO ZOOM OUT

PRESS RETURN TO LEAVE ZOOM MODE

.01  $\mu$ SEC.  
4760 DELAY

R H W D A T A

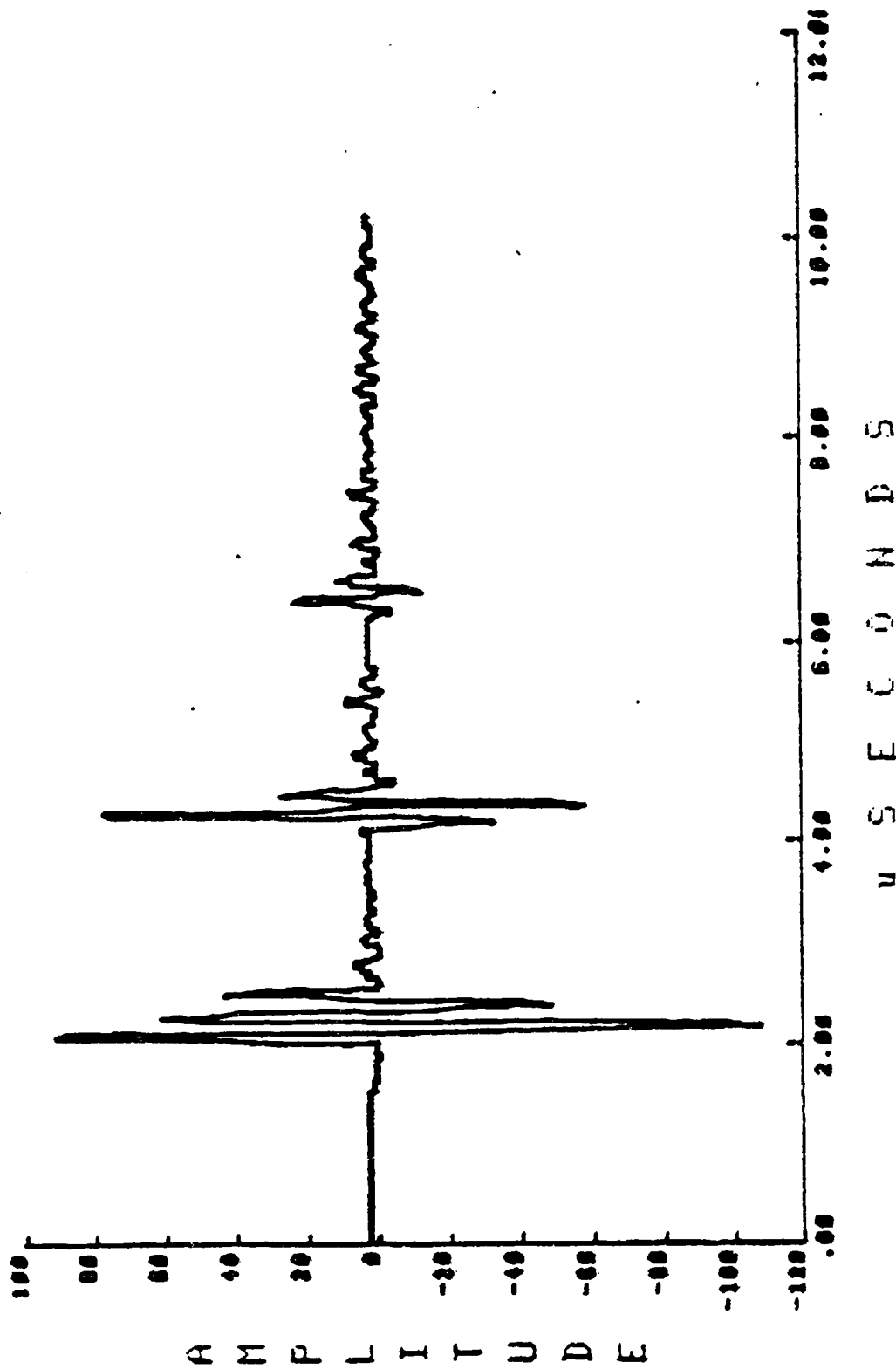


Figure 2-4

# EXAMPLE DEMONSTRATING THE USE OF ZOOM

POSITION CURSOR OVER POINT OF INTEREST

ENTER "1" TO ZOOM IN

ENTER "0" TO ZOOM OUT

PRESS RETURN TO LEAVE ZOOM MODE

.01 μSEC.  
5000 DELAY

R A W D A T A

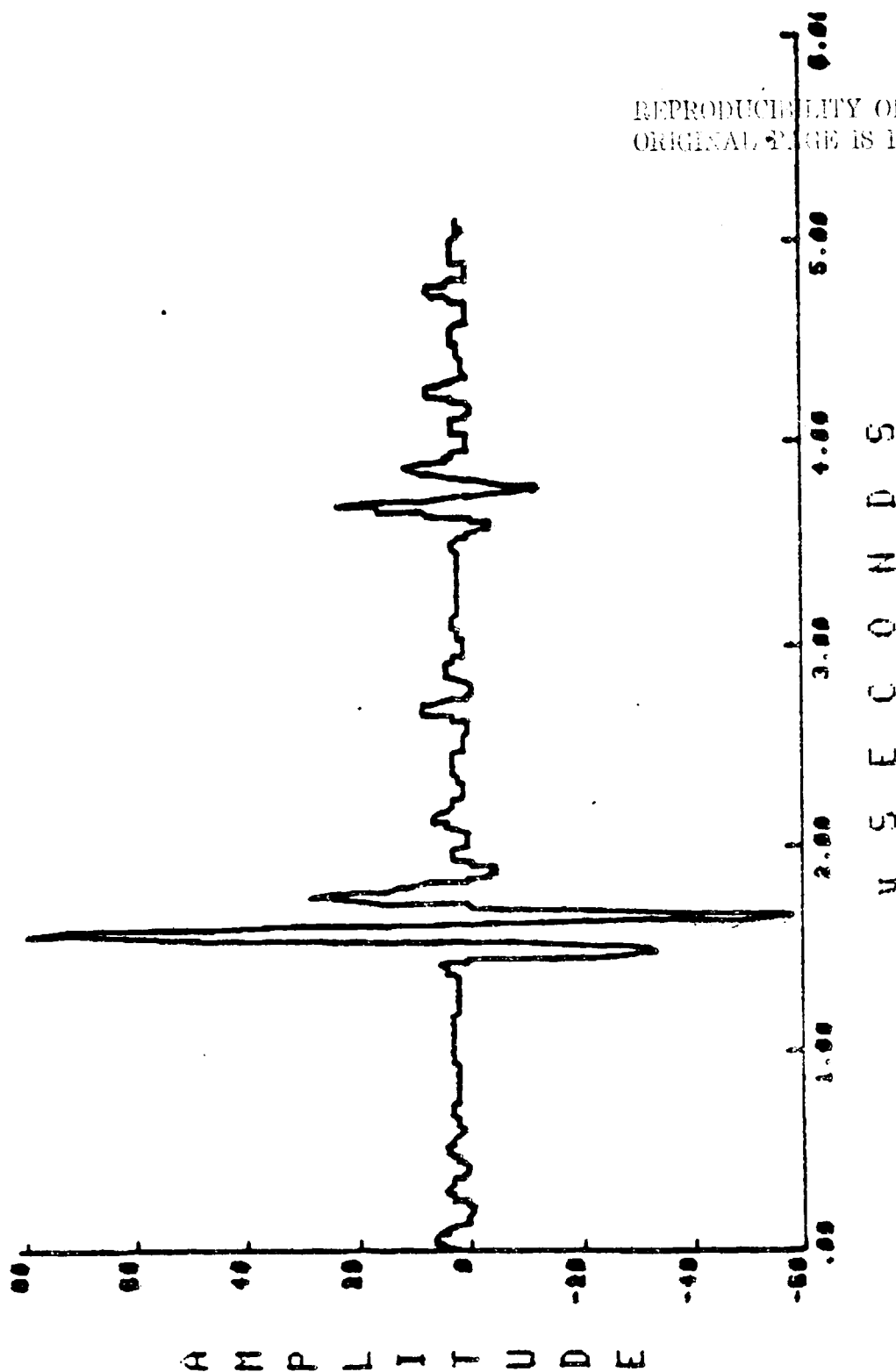


Figure 2-5

# EXAMPLE DEMONSTRATING THE USE OF ZOOM

POSITION CURSOR OVER POINT OF INTEREST

ENTER "1" TO ZOOM IN

ENTER "0" TO ZOOM OUT

PRESS RETURN TO LEAVE ZOOM MODE

.01 USEC.  
5160 DELAY

R A H D A T A

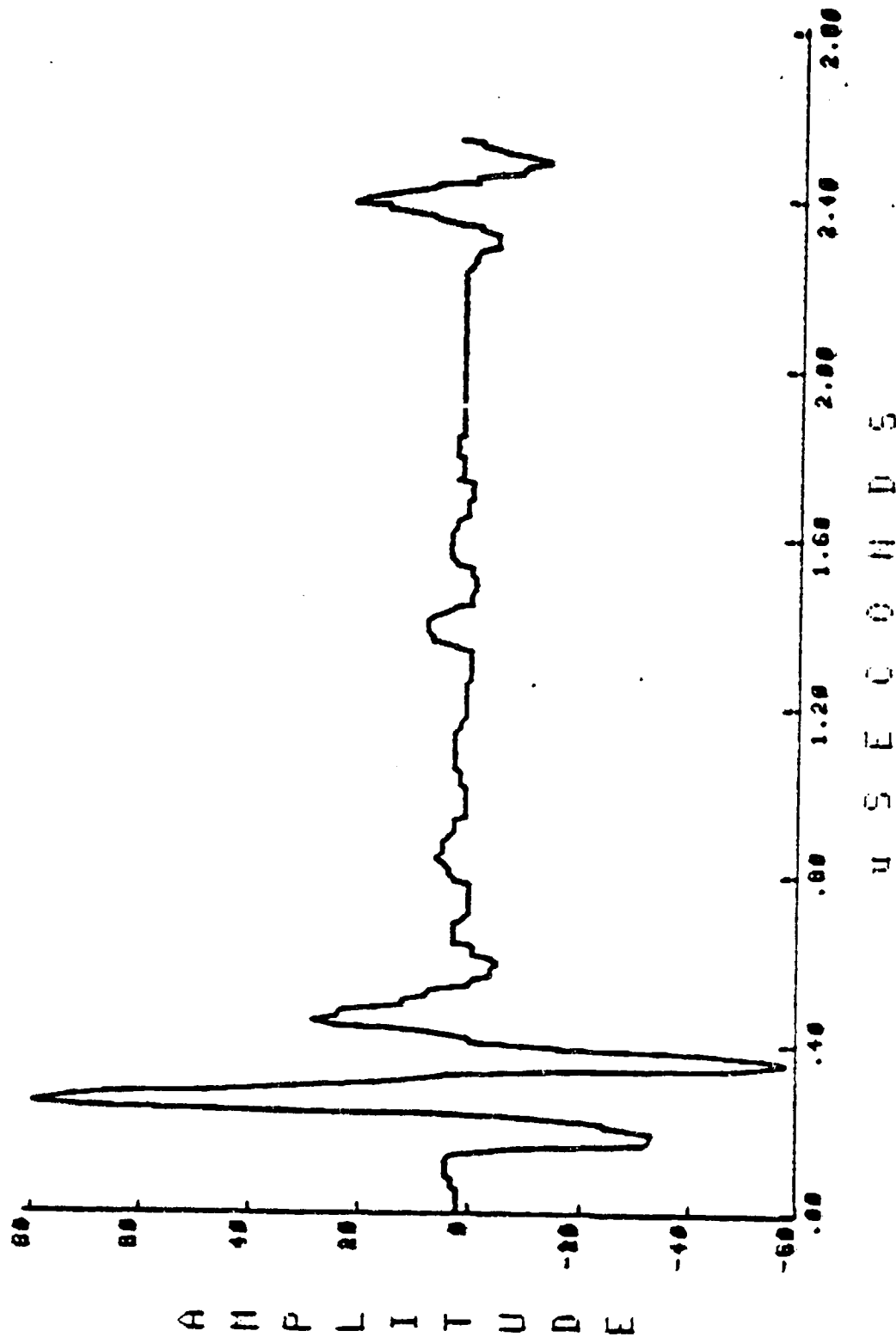


Figure 2-6

# EXAMPLE DEMONSTRATING THE USE OF ZOOM

POSITION CURSOR OVER POINT OF INTEREST

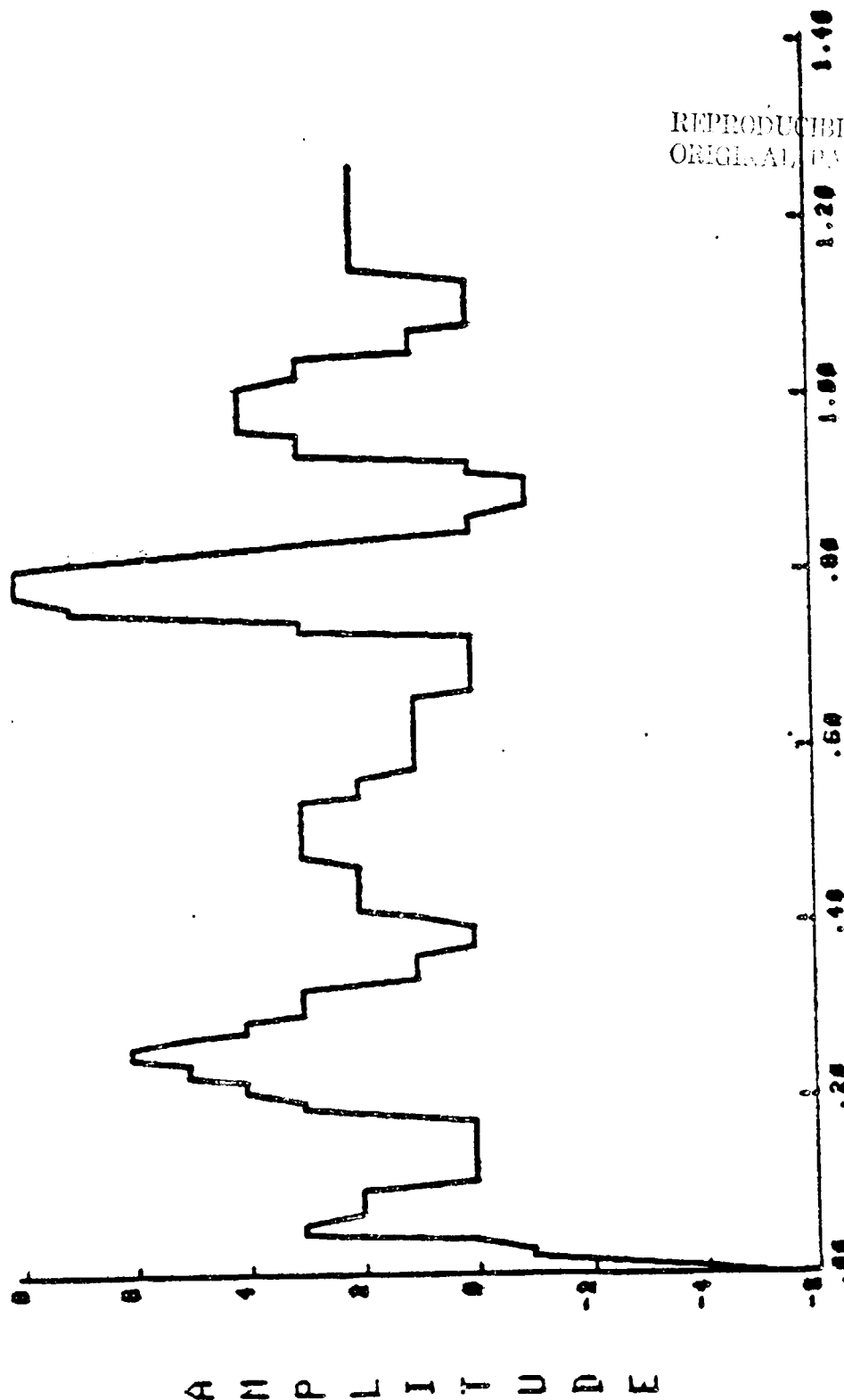
ENTER "1" TO ZOOM IN

ENTER "0" TO ZOOM OUT

PRESS RETURN TO LEAVE ZOOM MODE

.01 VSEC.  
\$220 DELAY

R A W D A T A



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U S E C O H D S

Figure 2-7

## 2.2 ZOOM Control

In the PUT System, selection of parameters which affect what portion of a signal is to be recorded and what portion of the recorded signal is to be processed are not under direct operator control. Instead, the system determines these parameters based upon a single, simple operator input to ZOOM control.

ZOOM control is activated by pressing "Z" on the control terminal. This causes the system to acquire and display one frame of raw signal data, to prepare the terminal for graphic input via the joystick, and to display prompting information for the required input.

Input consists of positioning the graphic crosshair over the center of the portion of the displayed signal which is of interest. The operator then presses "I" to zoom in on this region or "O" to zoom out. The system uses this input to determine values for the recording sample interval, recording delay after trigger, display start time, and display range. Figures 2-1 through 2-7 demonstrate the operation of ZOOM.

## 2.3 SCAN Control

PUT provides several sources for data to be processed and displayed. The data source may be specified by pressing S on the control terminal. The operator will then be prompted by an option selection display:

```
S
SCANNER CONTROL:
SELECT INPUT SOURCE
0 = SIMULATED DATA
1 = REAL TIME DATA
2 = RECORDED DATA
3 = SAME SCAN
```

### 2.3.1 Simulated Data

There are three waveforms available for simulated input: sine wave, square wave, and spike. These waveforms may be used to test portions of the processing system. Particularly, the operator may test the Elsytec array processor by taking the FFT of a sine or square wave signal and checking the displayed frequency plot for the well known frequency characteristics of these signals.

When source 0 is selected from the above option display, the operator is given a second option display:

0  
SIMULATED DATA:  
SELECT WAVEFORM  
0 = SINE WAVE  
1 = SQUARE WAVE  
2 = SPIKE

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When SINE or SQUARE waves are selected, the operator is prompted to input waveform frequency with the joystick. The selected wave form is stored in the input buffer and may be processed in the same manner as an input signal.

### 2.3.2 Real Time Data

Selection of the REAL TIME DATA option (1) from the scanner control option display specifies that the data come from the ultrasonic transducer. The pulser unit should be turned on and set to external trigger mode on its front panel. (More information on pulser unit setup may be found in Appendix Q.) A second option display is put up on the terminal:

1  
SELECT REAL TIME MODE  
0 = NO SCAN  
1 = SCAN  
2 = RESCAN

Selection of the NO SCAN option (0) from this display causes the probe to remain stationary and a new signal to be acquired from the same point for each display or averaging cycle. Selection of the SCAN option (1) causes the display of the following message:

ENTER SCAN LIMITS  
USING REMOTE CONTROL:  
TOGGLE M, POSITION SCANNER TO LOWER LIMIT.  
PRESS RESET TO SEND COORDINATES.  
POSITION SCANNER TO UPPER LIMIT.  
TOGGLE C, PRESS RESET TO SEND COORDINATES.  
COMPUTER WILL VERIFY COORDINATE RECEIVED WITH BELL.

The operator should follow these instructions to input the limits of the scan. Selection of the RESCAN option in the REAL TIME option display simply causes the scan limit input to be skipped. Any previously entered scan limits will be used.

### 2.3.3 Recorded Data

When RECORDED DATA (2) is selected from the scanner control option display, and a recorded data file has previously been specified and is open, the file is closed, and a message is generated to inform the user of the file closure. The user is also interrogated as to whether a new file should be opened. Any response other than "Y" terminates the recorded data option and returns to the primary PUT option display. If "Y" is entered in response to this query or if no file was open, the user is prompted to select a file option from the file option display:

```
SELECT FILE OPTION
0 - DEFAULT FILE TO "SCRTCH.DAT"
1 - ENTER FILE NAME
2 - USE PREVIOUS FILENAME OF . . .
```

Option 2 appears only if a filename has been previously specified in this run. If either option 0 or 2 is selected, an attempt is made to open the file on DK1 (all data files reside on DK1). If option 1 is chosen, the system responds with:

```
ENTER FILENAME
```

The user should then enter the name of a previously recorded data file on DK1. The filename format is NNNNNN.XXX. No device name may be entered. The extension (XXX) must be three characters long and would normally be "DAT". When the last character of the extension is entered, an attempt is made to open the file. In each of the above cases, when the file selected is not found, a message to that effect is printed, and control is returned to the file options display. When a filename has been successfully entered, the file is opened and subsequent data collection cycles will access data from this file.

### 2.3.4 Same Scan

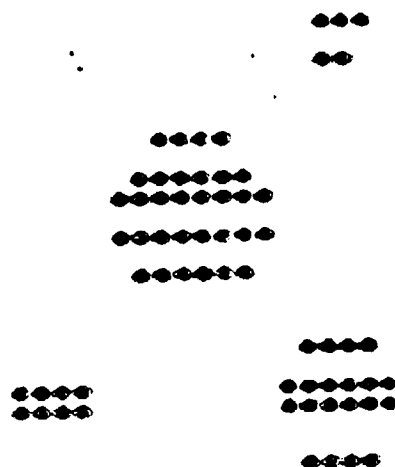
When the SAME SCAN option (3) is selected from the Scanner control option display, the last signal acquired is maintained in the system for all subsequent displays until another Scanner control option is selected.

### 2.4 VIEW Control

Once a threshold scan of a rectangular region has been completed, it is possible to request multiple subscans of this region to be performed at higher resolution than the original scan. Once a subscan of a region is defined, it is possible to position the Scanner over single points within the subregion for detailed signal analysis. These functions are performed in VIEW control which is accessed by pressing "V" on the control terminal.

THRESHOLD SCAN FROM VIEW CONTROL

SUB SCAN  
 USING CURSOR SELECT OPPOSITE CORNERS OF SCAN  
 PRESS RETURN TO ENTER COORDINATE



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Figure 2-8

POINT SCAN  
THRESHOLD SCAN FROM VIEW CONTROL  
POSITION CURSOR TO SELECT POINT  
PRESS RETURN TO ENTER COORDINATE

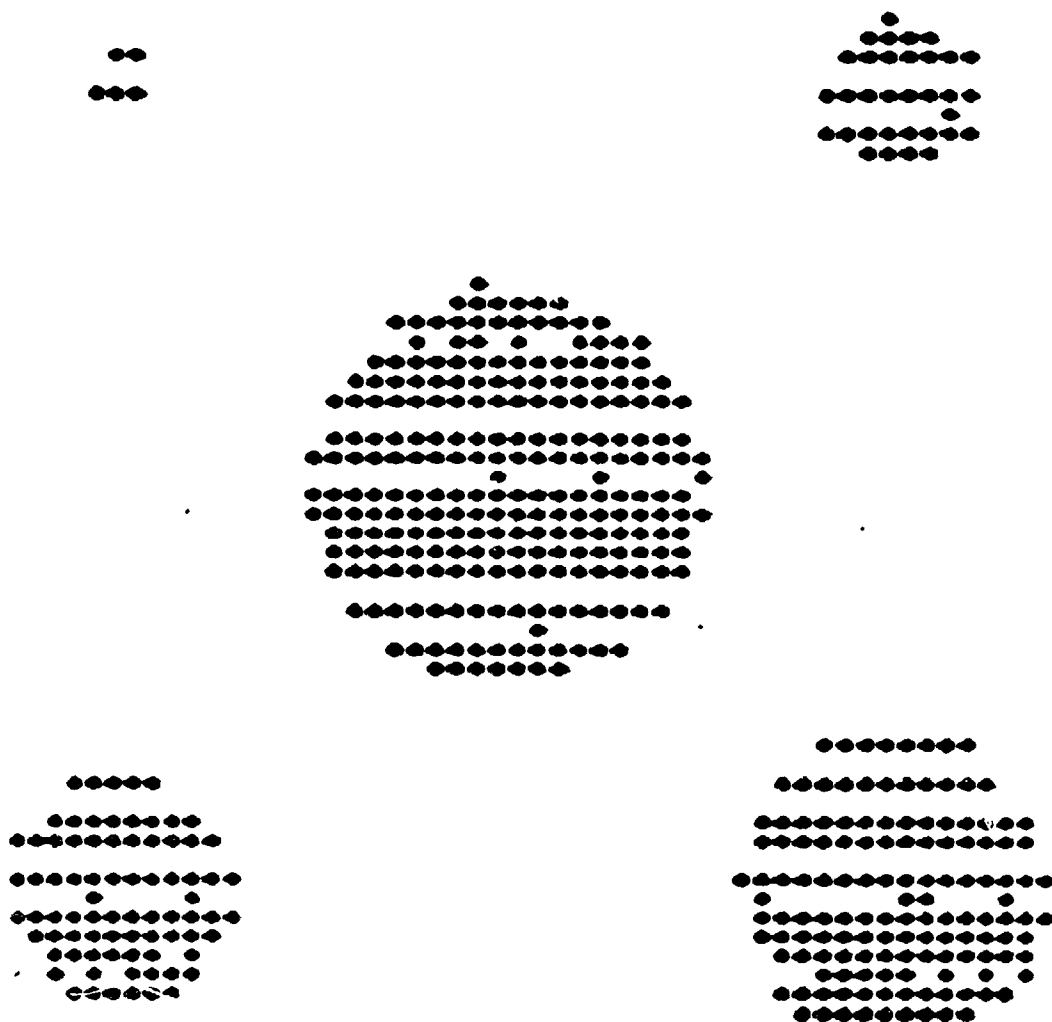


Figure 2-9

Upon entry to VIEW control, the following prompt is displayed:

SELECT VIEW MODE  
0 = DEFINE NEW SUBSCAN  
1 = DEFINE NEW POINT SCAN

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If DEFINE NEW SUBSCAN is selected, then the primary threshold scan is displayed, the terminal is placed in GRAPHIC INPUT mode, and a prompt is displayed requesting that two points be entered to define the subregion for a secondary threshold scan.

If DEFINE NEW POINT SCAN is selected, then the secondary threshold scan is displayed, the terminal is placed in GRAPHIC INPUT mode, and a prompt is displayed requesting that a single point be entered to position the scanner for stationary signal analysis.

Figures 2-8 and 2-9 are threshold scans from VIEW control.

## 2.5 DISPLAY Control

There are six graphic displays available within the PUT system. The operator may choose the display he is interested in by pressing "D" on the control terminal. In DISPLAY control, the operator is prompted to select one of the display types. The type selected becomes the active display and will be plotted at the end of each data collection cycle. All scaling, labeling, and calculations necessary to generate the displays are selected automatically.

Figure 2-10 through 2-15 are examples of each display type. The first four are typical signal analysis plots. The last two display the contents of the 64 x 64 scan grids that are used by VIEW control.

## 2.6 AVERAGING Control

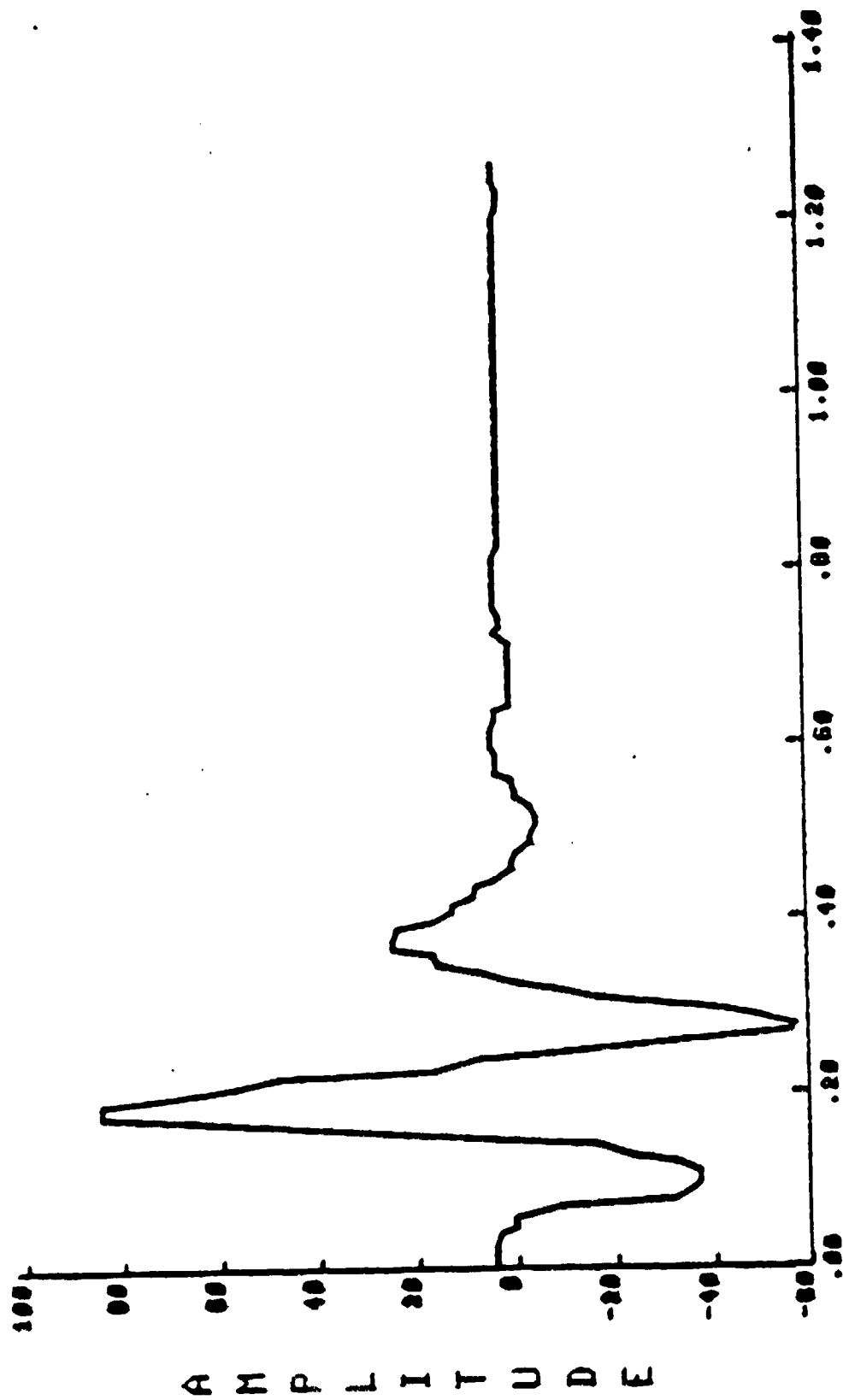
When data is being acquired from a stationary probe, it is possible to average the returns from multiple pulses in order to eliminate random noise. The ECHO1 system allows up to 99 pulses to be averaged prior to performing calculations and display. To select AVERAGING, the operator presses "A" at the control console. The operator is prompted to enter the number of scans (pulses) to be averaged. AVERAGING remains in effect until the operator returns to AVERAGING control and selects zero or one scans to be averaged.

DISPLAY TYPE

PAUSE

.01 USEC.  
5000 DELAY

R A W D A T A



USECONDS

Figure 2-10

DISPLAY TYPE

.01 USEC.  
8320 DELAY  
INTERPOLATING

M A G N I T U D E F F T

PAUSE

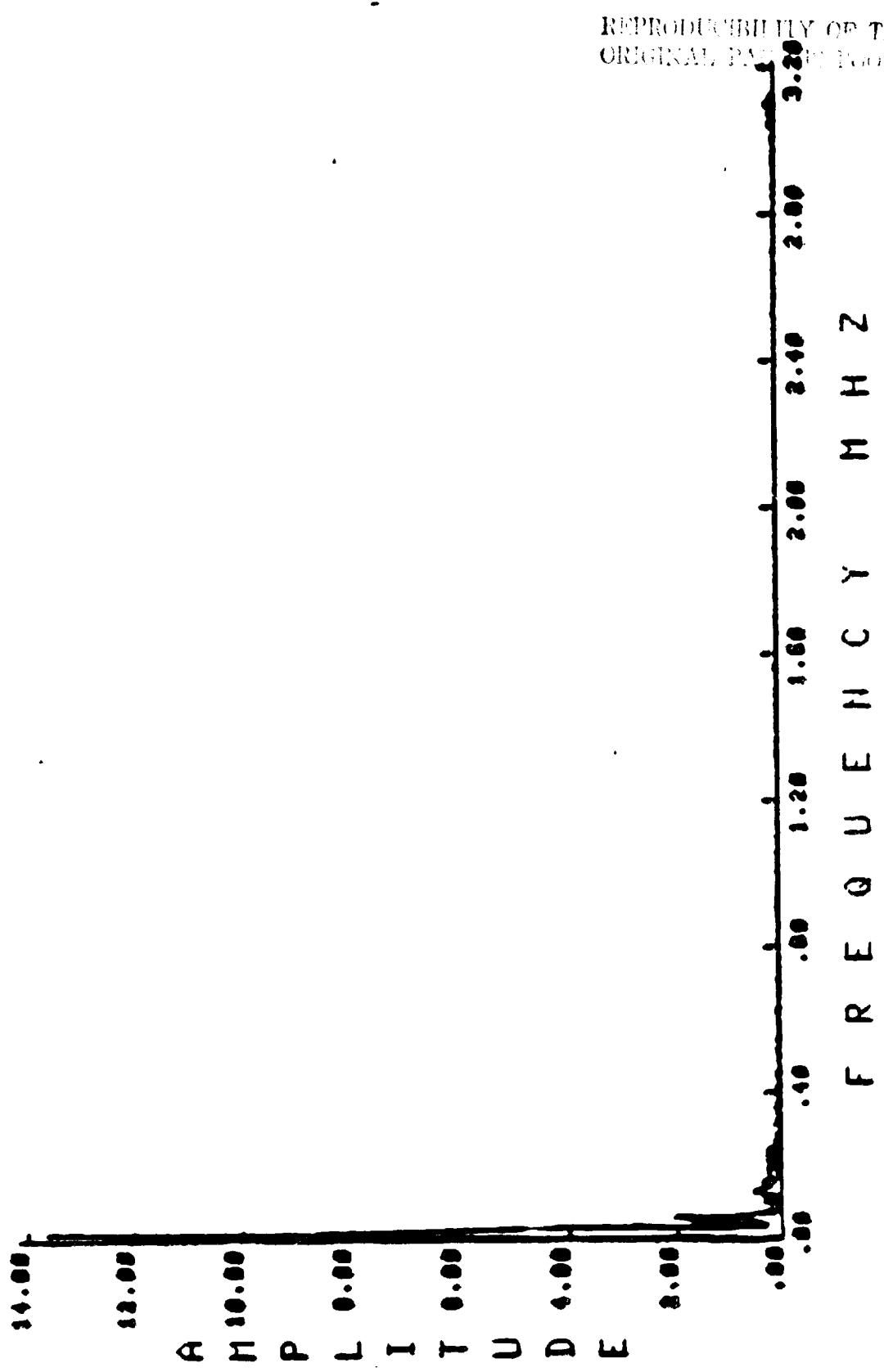


Figure 2-17

DISPLAY TYPE

PAUSE

.01  $\mu$ SEC.  
5220 DELAY  
INTERPOLATING

P H A S E S H I F T F F T

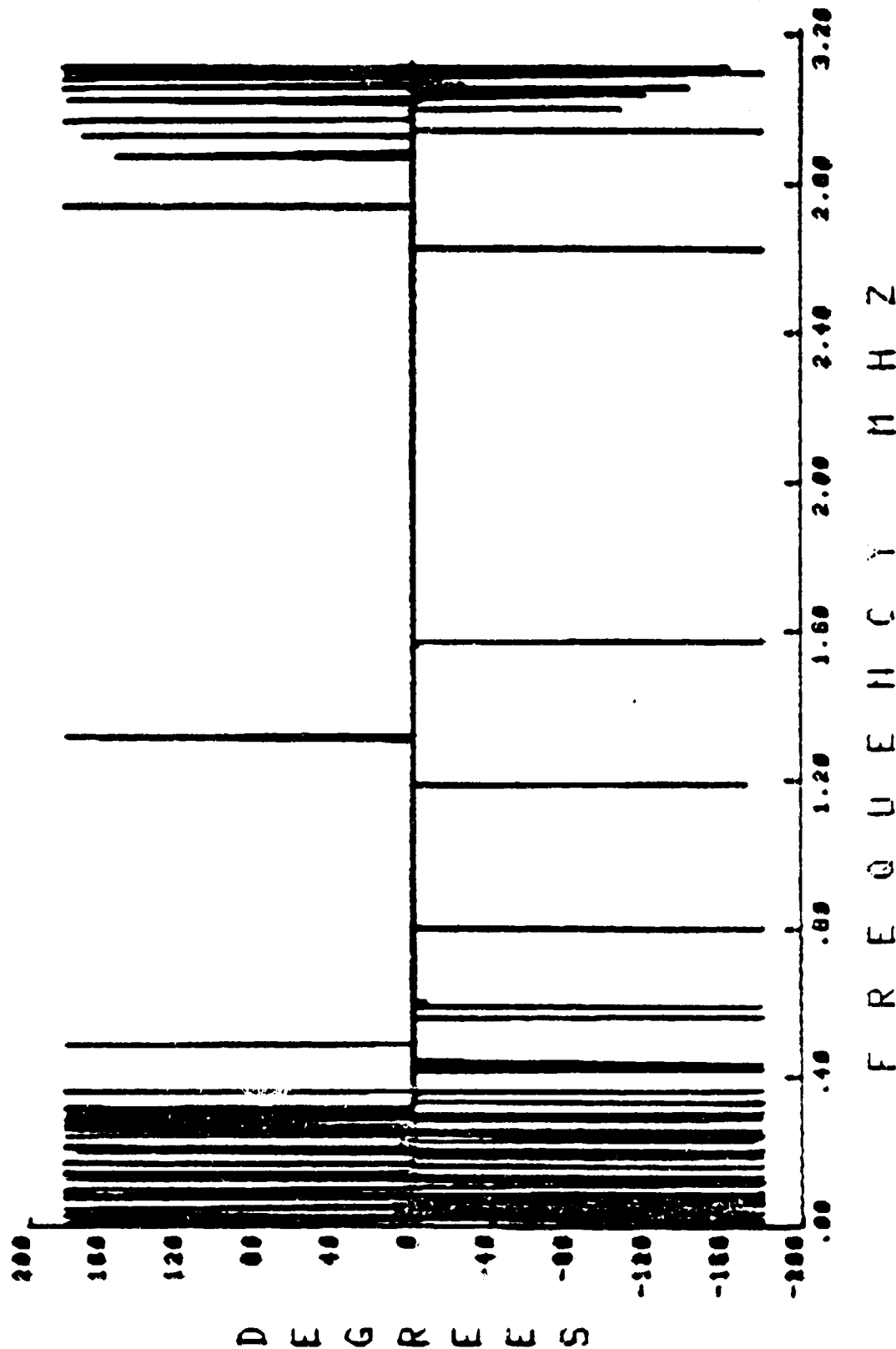


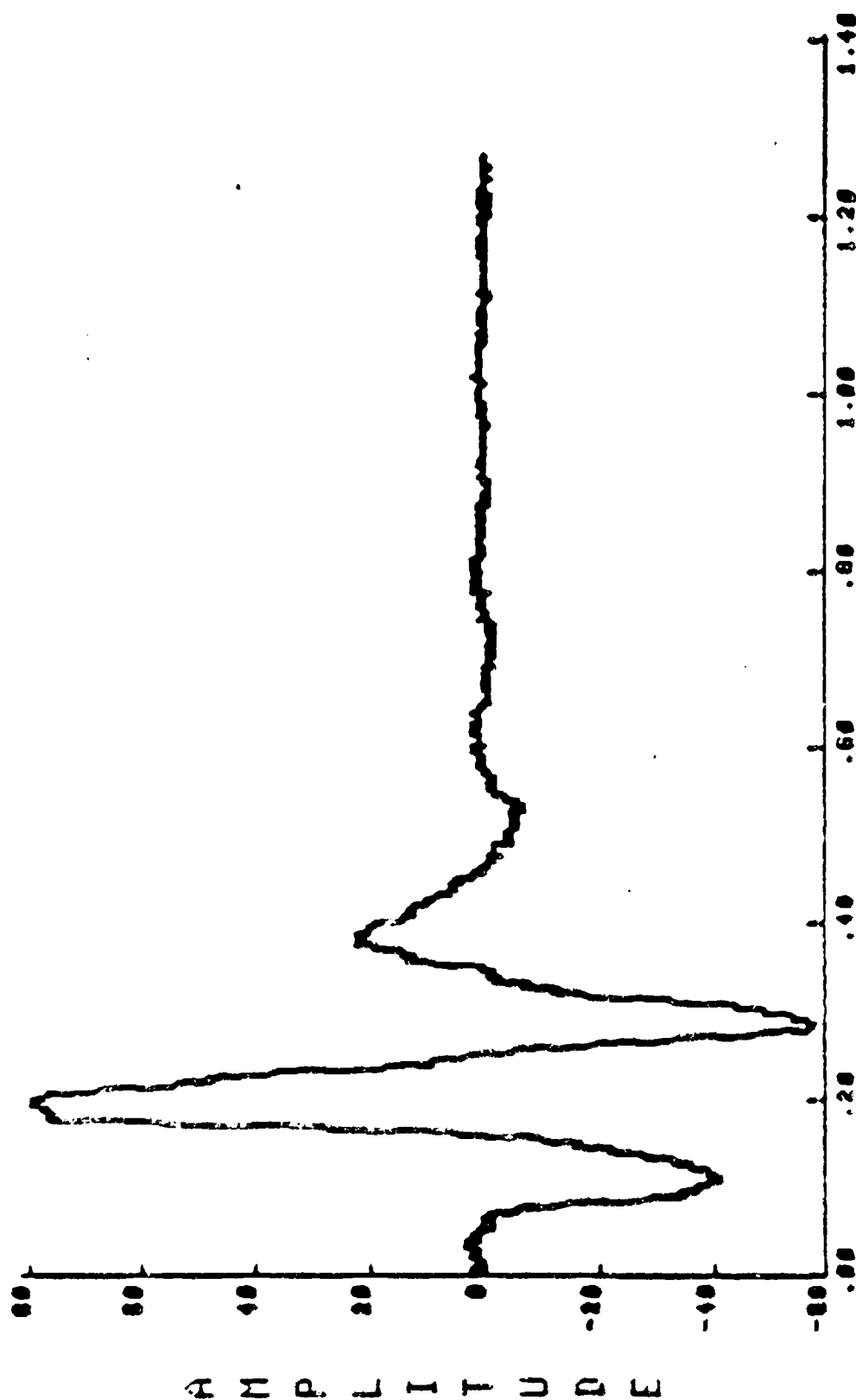
Figure 2-12

.01 USEC.  
0.220 DELAY  
INTERPOLATING

DISPLAY TYPE

I N O E R S E F F T

PAUSE



u S E C O N D S

Figure 2-12

DISPLAY TYPE

PAUSE

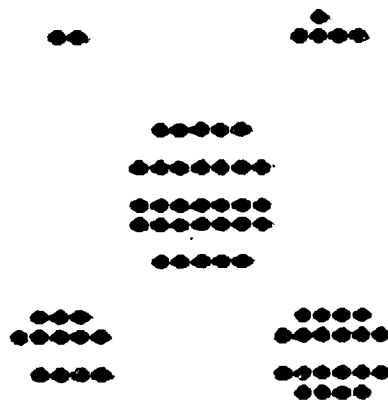


Figure 2-14

DISPLAY TYPE

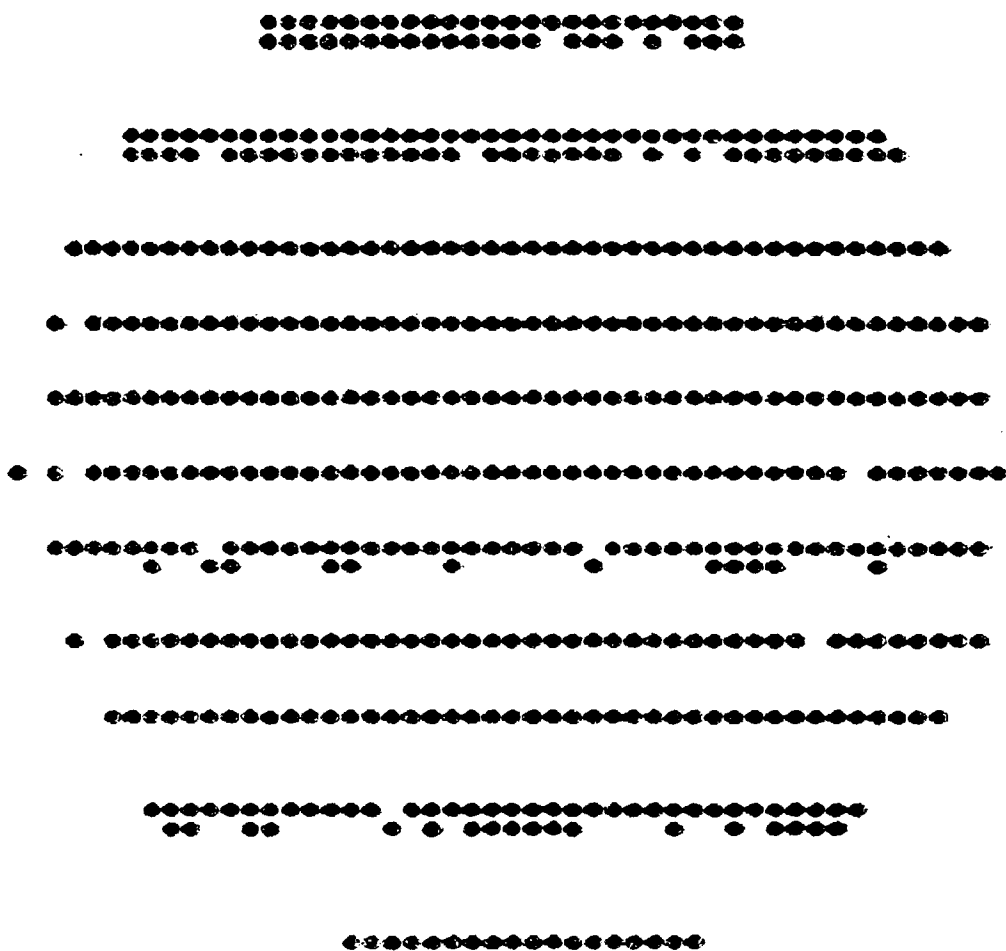


Figure 2-15

PAUSE

# EXAMPLE OF THE USE OF EXAMINE

POSITION CURSOR OVER POINT OF INTEREST

ENTER 'I' TO X IN

ENTER 'O' TO X OUT

PRESS RETURN TO LEAVE X MODE

M A G N I T U D E F F T

.01 USEC.  
5220 DELAY  
INTERPOLATING  
X ACTIVE

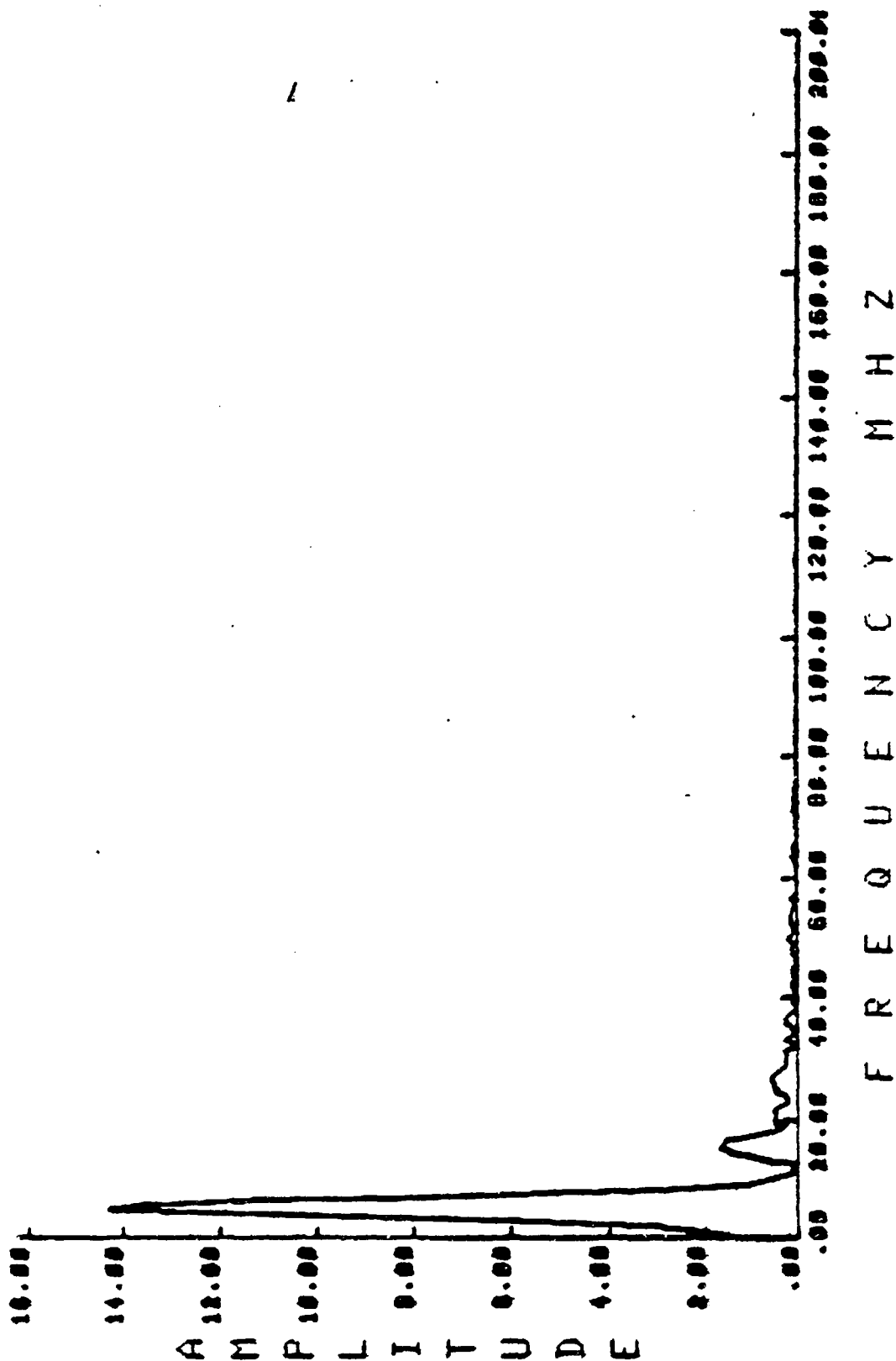


Figure 2-16

# EXAMPLE OF THE USE OF EXAMINE

POSITION CURSOR OVER POINT OF INTEREST

ENTER 'I' TO X IN

ENTER 'O' TO X OUT

PRESS RETURN TO LEAVE X MODE

M A G N I T U D E F F T

.01 USEC.  
5230 DELAY  
INTERPOLATING  
X ACTIVE

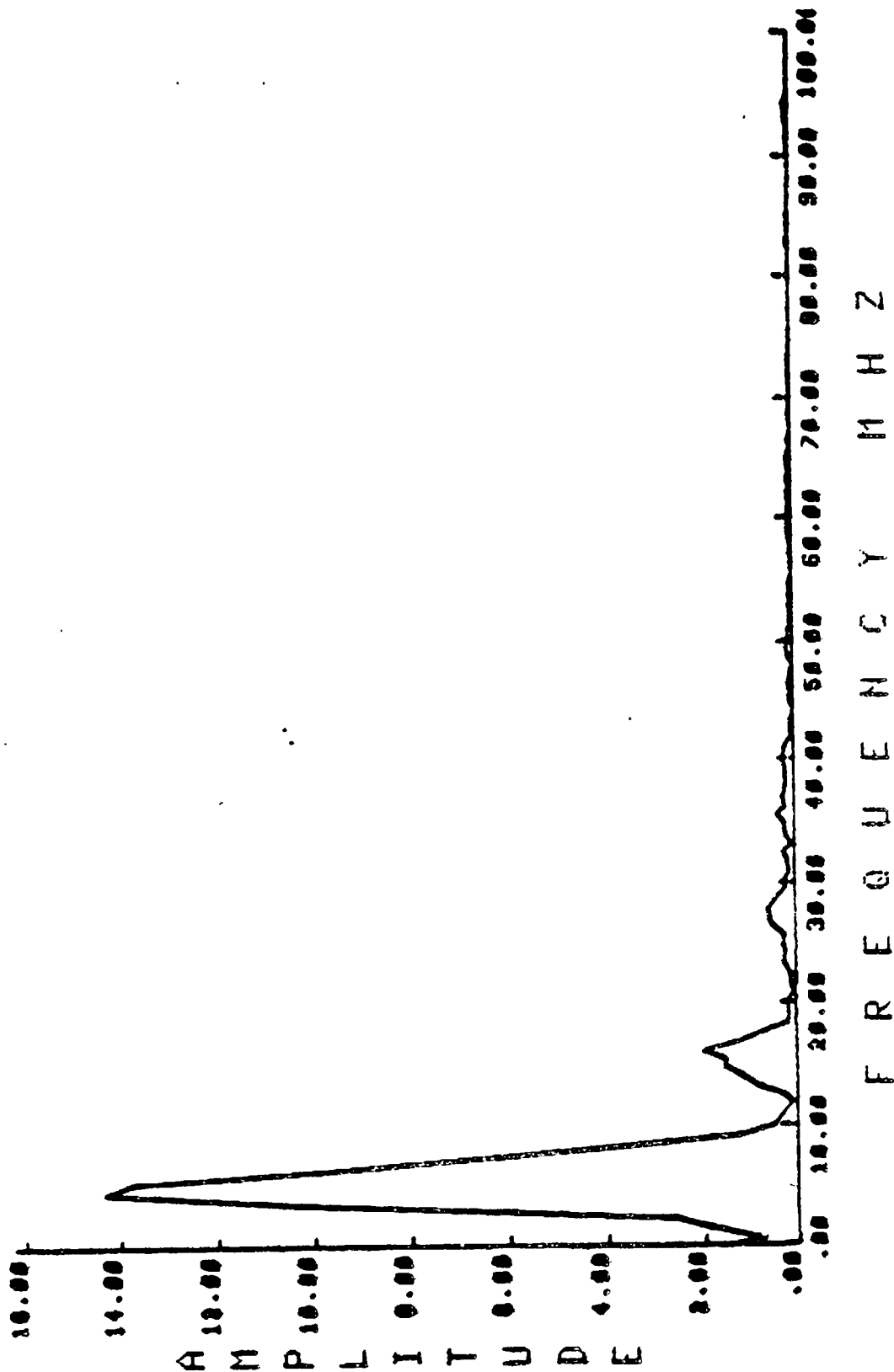


Figure 2-17

# EXAMPLE OF THE USE OF EXAMINE

POSITION CURSOR OVER POINT OF INTEREST

ENTER '1' TO X IN

ENTER '0' TO X OUT

PRESS RETURN TO LEAVE X MODE

M A G N I T U D E F F T

.01 MSEC.  
5220 DELAY  
INTERPOLATING  
X ACTIVE

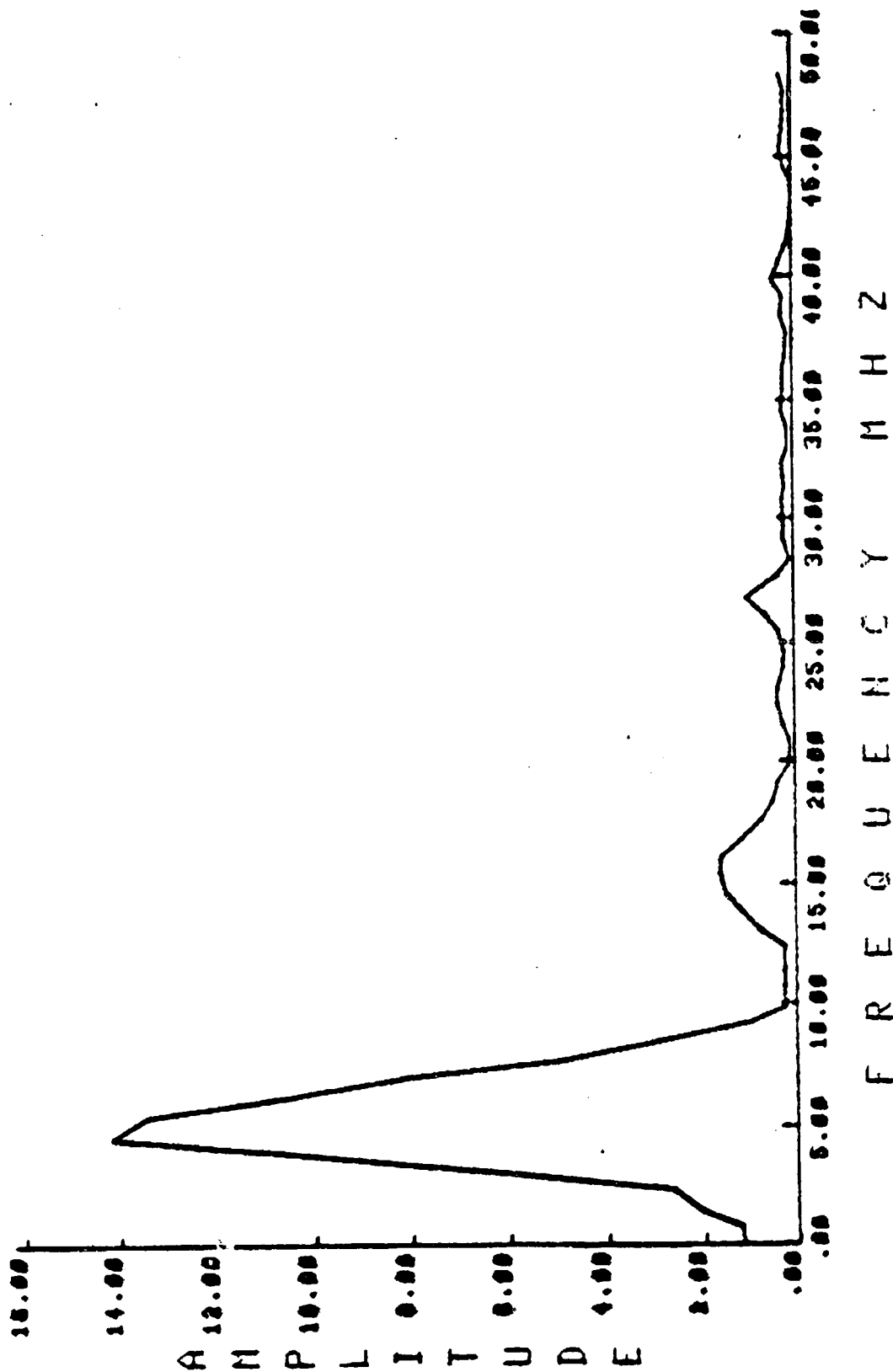


Figure 2-13

## 2.7 EXAMINE FFT

When FFT display is selected, the range of frequencies plotted is a function of the number of points processed. As a result of this default, most FFT displays contain more data than the operator is interested in, and the data the operator wants is compressed and difficult to read. To solve this problem, the PUT System provides a capability similar to ZOOM which allows the operator to select any portion of the FFT plot to be displayed.

The EXAMINE capability is accessed by pressing "X" on the control terminal. This causes the system to acquire one frame of data, to calculate and display the FFT, to prepare the terminal for graphic input, and to display prompting information for the required input. As with ZOOM, this input consists of positioning the graphic crosshair over the center of the region of interest, then pressing "I" to zoom in on this point or "O" to zoom out from this point.

Figures 2-16 through 2-18 demonstrate the use of EXAMINE to zoom in on a FFT.

## 2.8 Windows

When "W" is pressed on the control terminal in response to the primary option display, the system responds with a WINDOW Type option:

```
W
WINDOW CONTROL REQUESTED
SELECT WINDOW TYPE
0 = FREQUENCY
1 = TIME
```

The window control system allows the operator to select specific portions of the time or frequency data for special processing. Windows are placed in the displayed data by identifying two opposite corners with the joystick.

### 2.8.1 WINDOW FFT

For most types of signal data, an operator will know the frequency range of his data and the frequencies at which noise will occur. In the PUT system, it is possible to produce an Inverse FFT signal plot which includes only those frequencies which the operator is interested in. This capability is provided through WINDOW FFT which is accessed by pressing "0" on the terminal when window options are displayed.

EXAMPLE OF THE USE OF WINDOW MODE

PAUSE

.01 VSEC.  
5220 DELAY

R A W D A T A

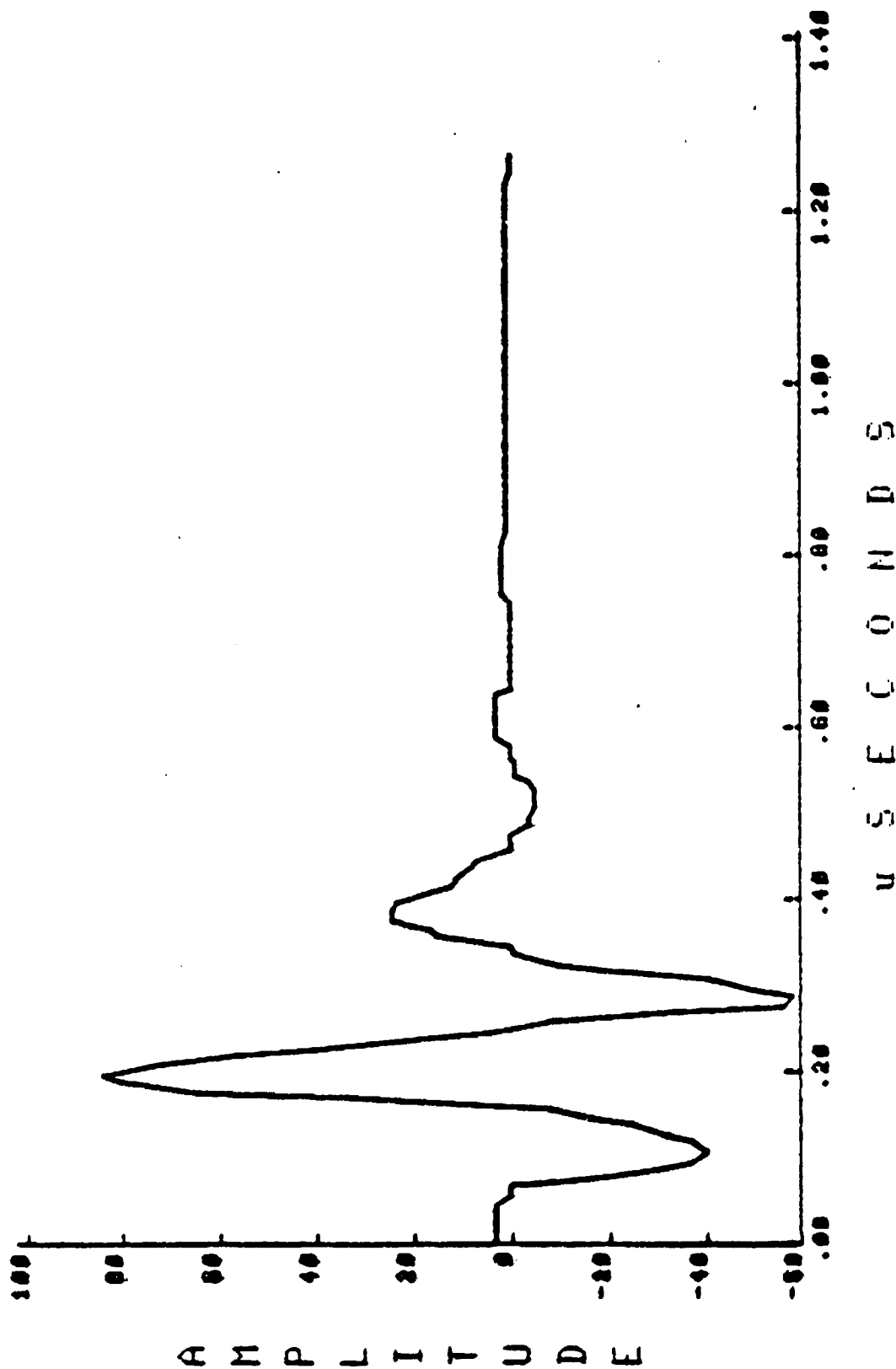


Figure 2-19

# EXAMPLE OF THE USE OF WINDOW MODE

TO DELETE WINDOW POSITION CURSOR ON WINDOW CORNER. PRESS '---'  
 TO ADD WINDOW SELECT TWO OPPOSITE CORNERS. PRESS '0' TO ENTER POINTS  
 TO LEAVE WINDOW MODE PRESS RETURN

.01 USEC.  
 3220 DELAY  
 INTERPOLATING  
 X ACTIVE

M A G N I T U D E F F T

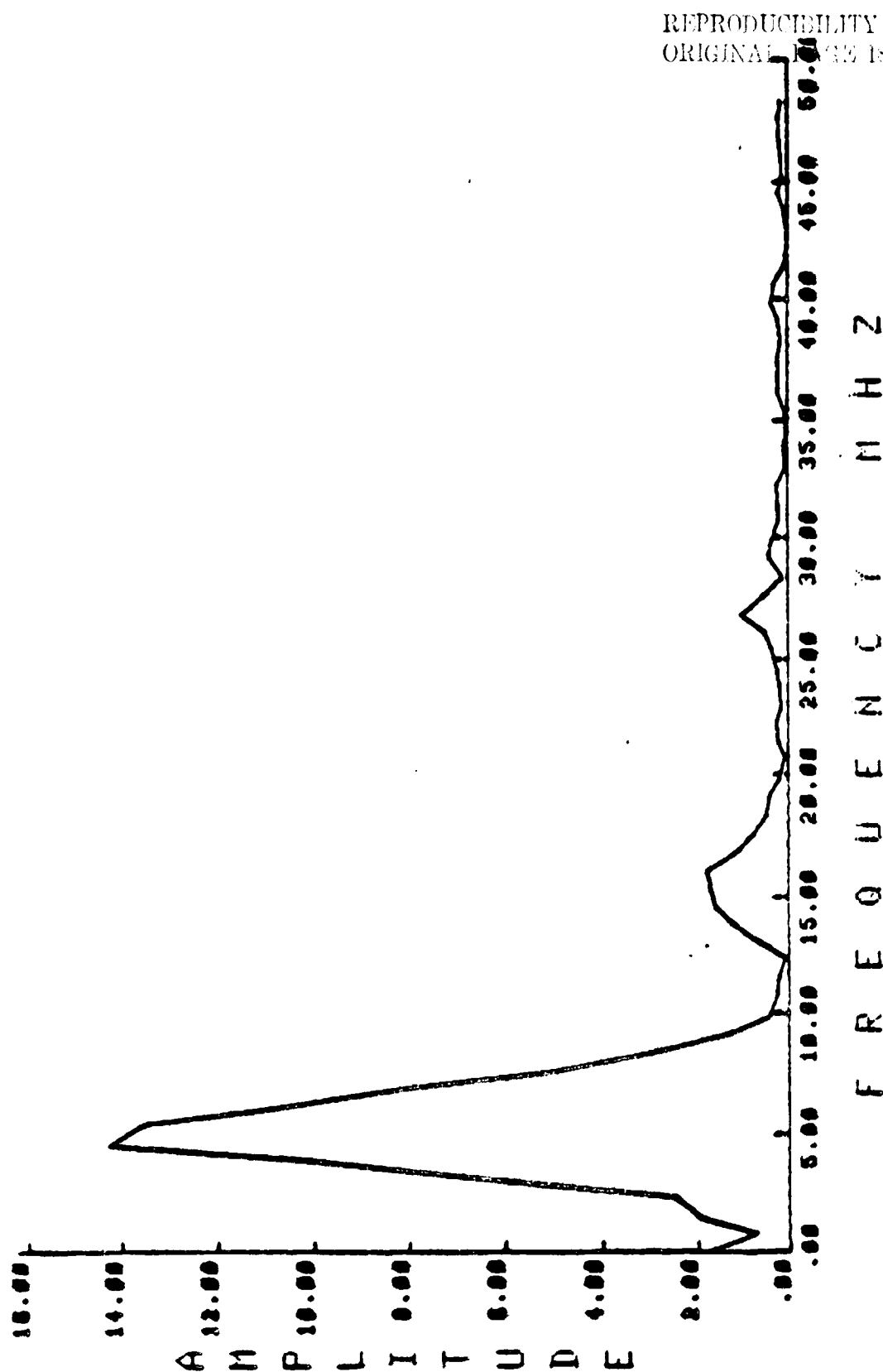


Figure 2-20

# EXAMPLE OF THE USE OF WINDOW MODE

TO DELETE WINDOW POSITION CURSOR ON WINDOW CORNER, PRESS '---'  
 TO ADD WINDOW SELECT TWO OPPOSITE CORNERS, PRESS '0' TO ENTER POINTS  
 TO LEAVE WINDOW MODE PRESS RETURN

.01 USEC.  
 0.250 DELAY  
 F-WINDOW ON  
 INTERPOLATING  
 X ACTIVE

M A G N I T U D E F F T

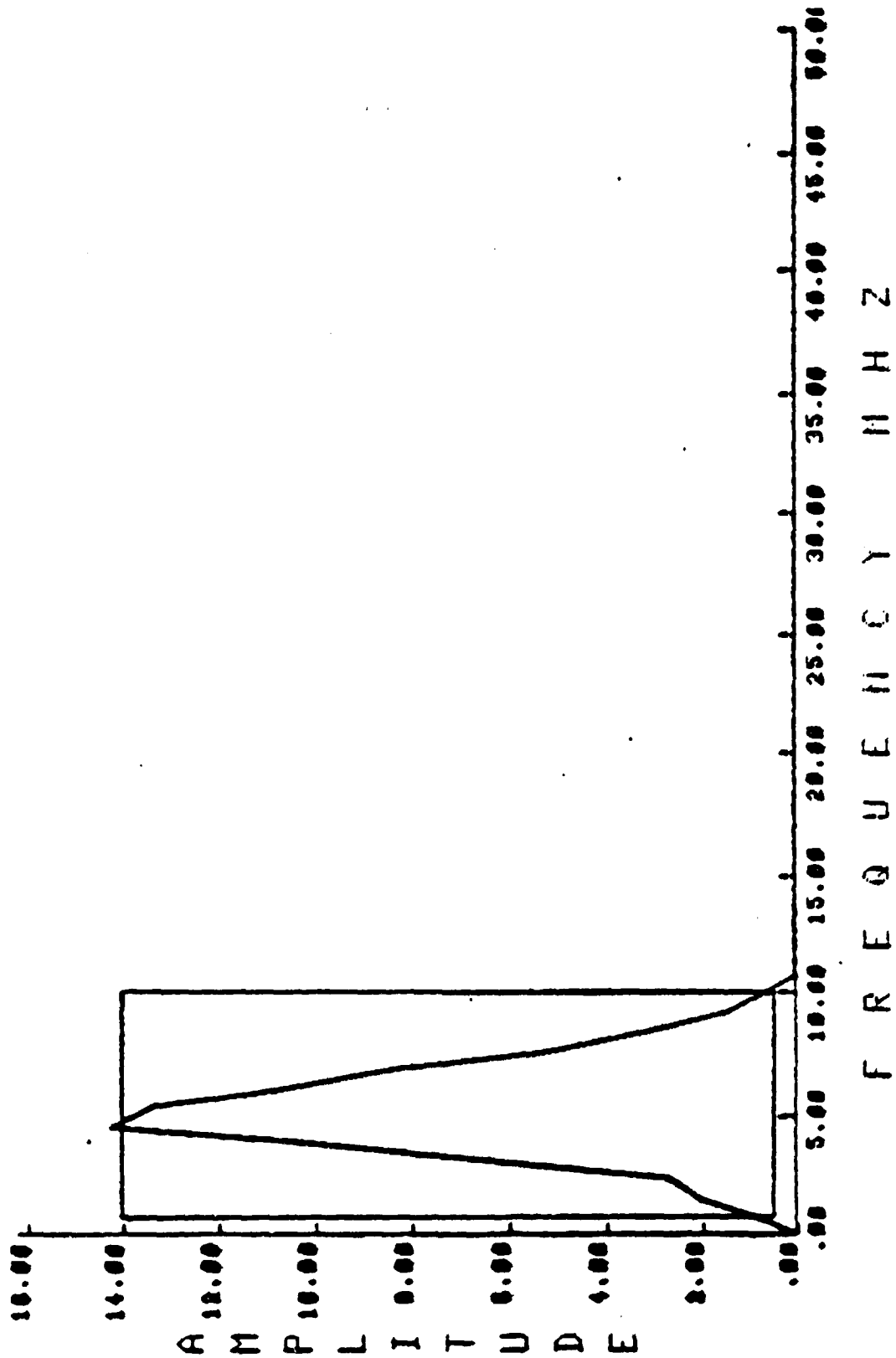


Figure 2-21

# EXAMPLE OF THE USE OF WINDOW MODE

.01 USEC.  
 5220 DELAY  
 F-WINDOW ON  
 INTERPOLATING

I N U E R S E F F T

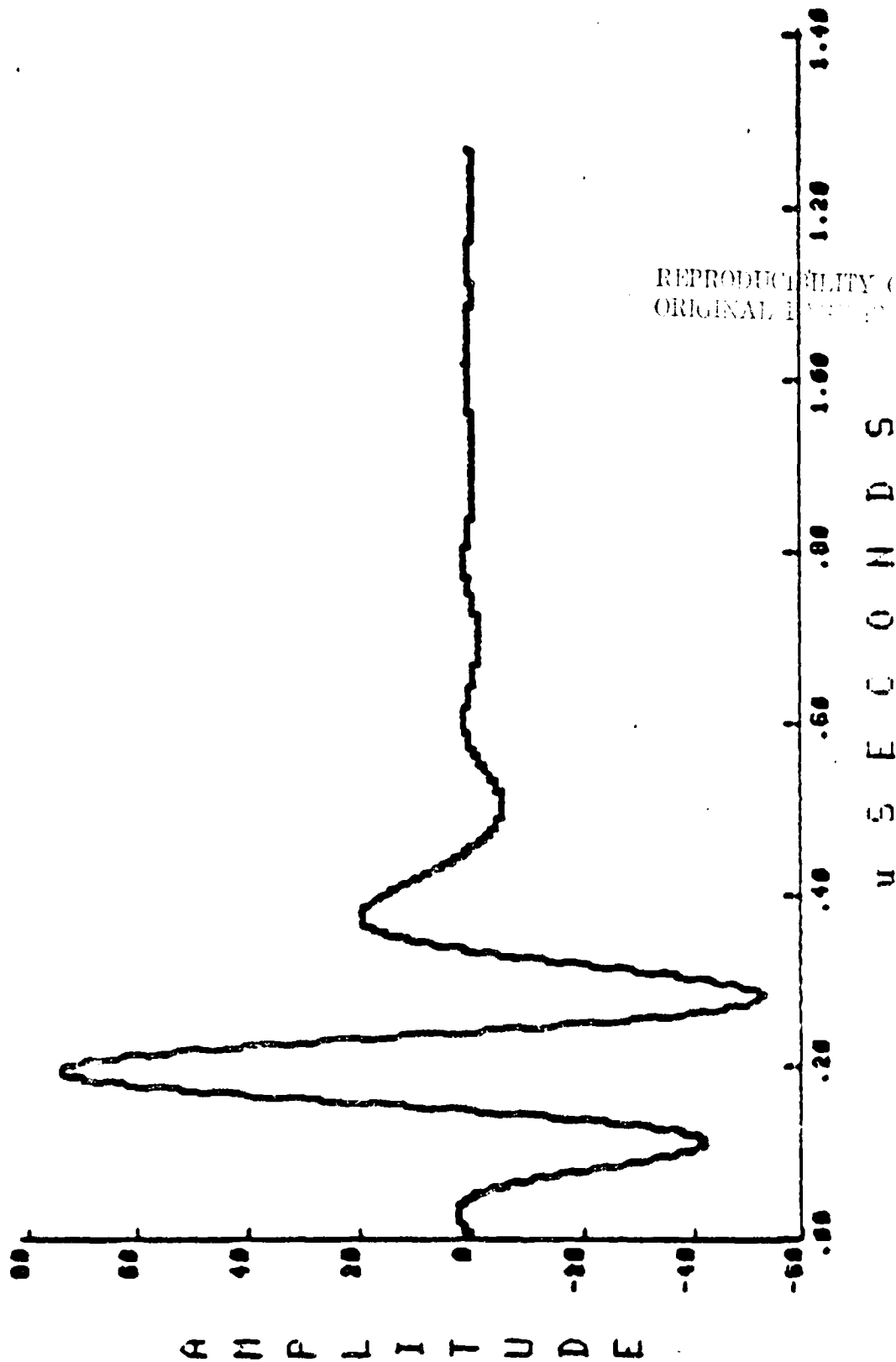


Figure 1-20

# EXAMPLE OF THE USE OF WINDOW MODE

TO DELETE WINDOW POSITION CURSOR ON WINDOW CORNER, PRESS '-'  
 TO ADD WINDOW SELECT TWO OPPOSITE CORNERS, PRESS 'Q' TO ENTER POINTS  
 TO LEAVE WINDOW MODE PRESS RETURN

M A G N I T U D E F F T

.01 USEC  
 5220 DATA  
 F-WINDOW ON  
 INTERPOLATING  
 X ACTIVE

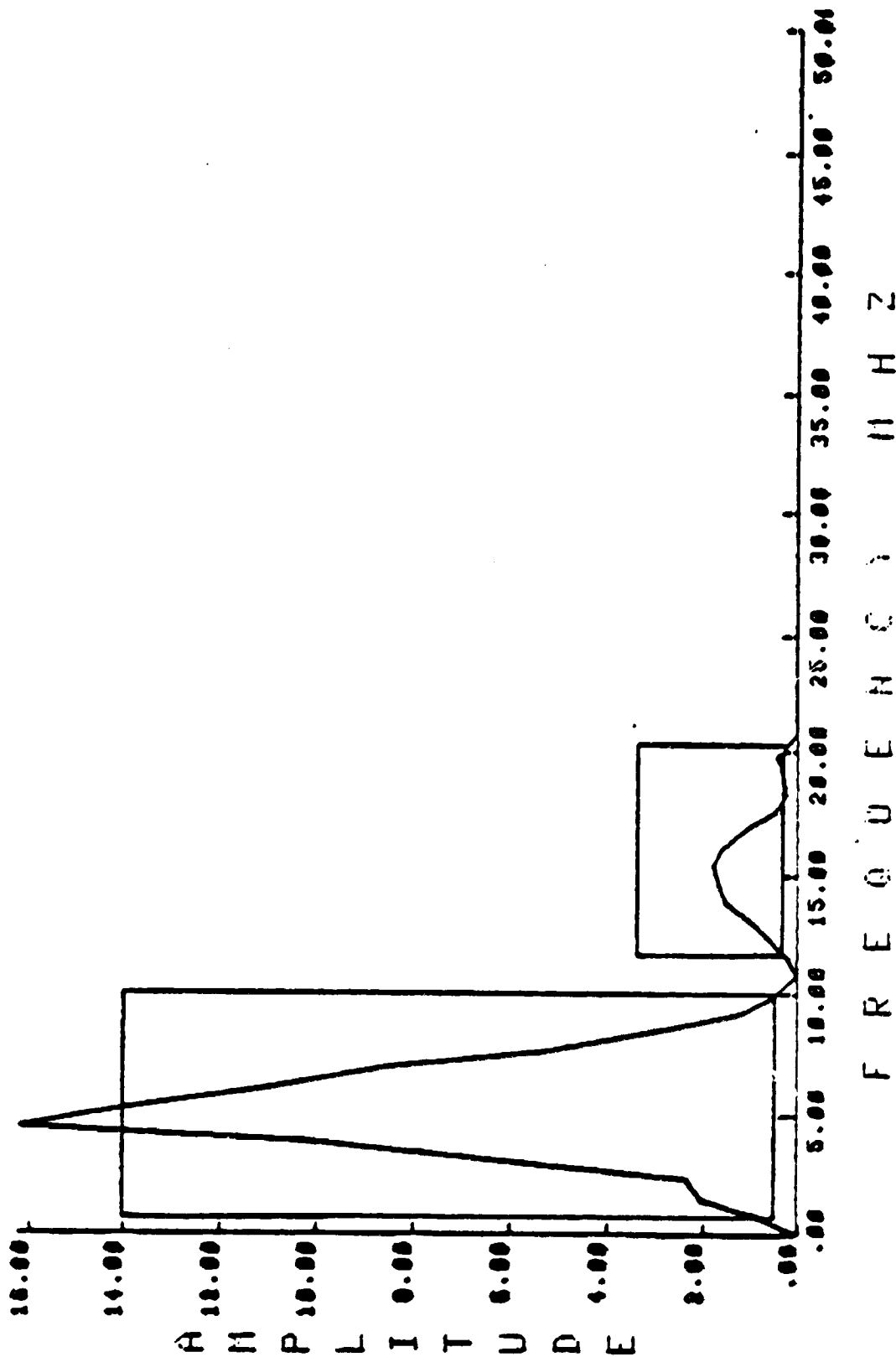


Figure 2-23

# EXAMPLE OF THE USE OF WINDOW MODE

PAUSE

.01 USEC.  
5220 DELAY  
F-WINDOW ON  
INTERPOLATING

I N V E R S E F F T

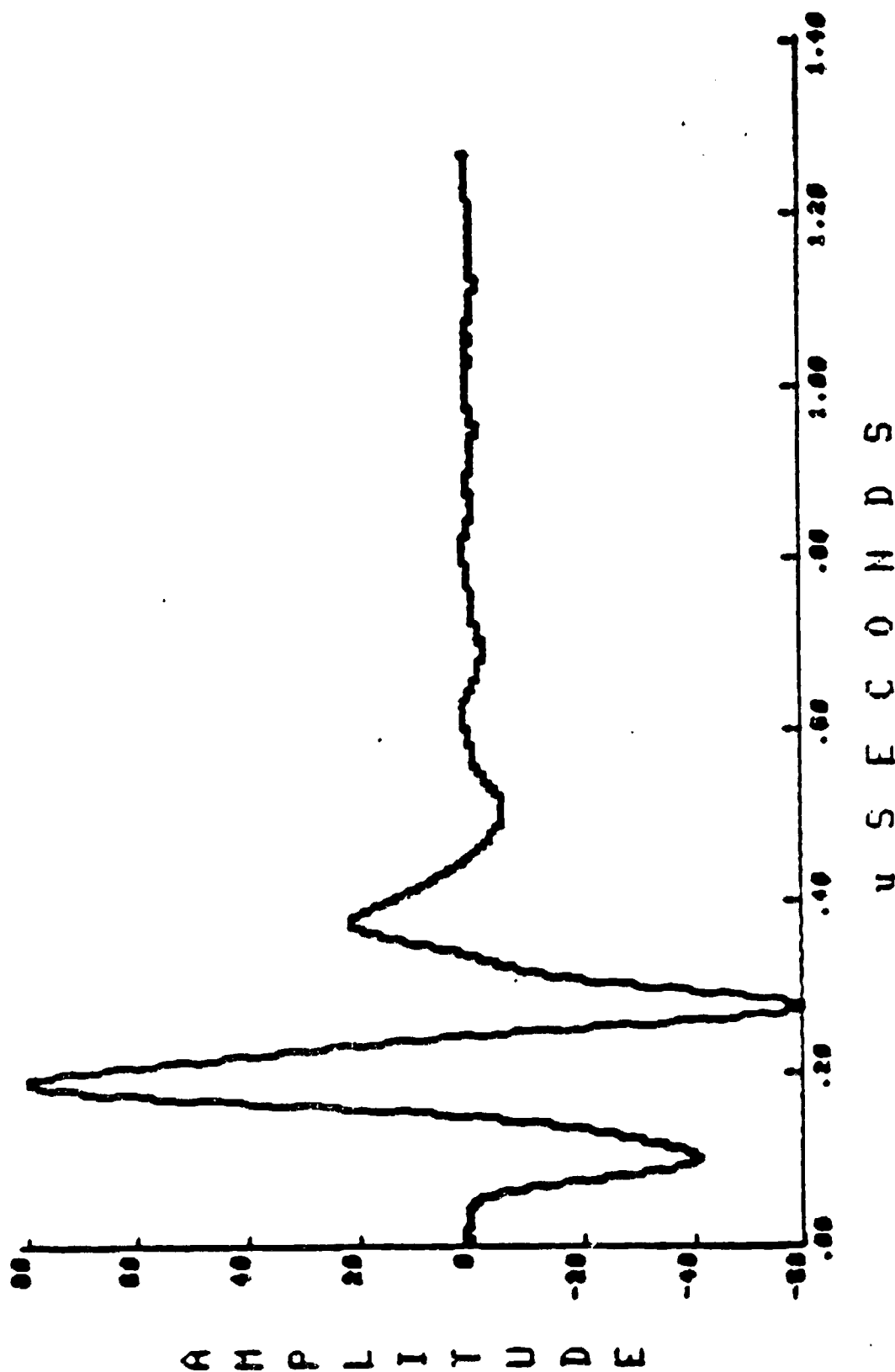


Figure 2-24

# EXAMPLE OF THE USE OF WINDOW MODE

- TO DELETE WINDOW POSITION CURSOR ON WINDOW CORNER, PRESS 'X'
- TO ADD WINDOW SELECT INTO OPPOSITE CORNERS, PRESS 'Q' TO ENTER POINTS
- TO LEAVE WINDOW MODE PRESS RETURN

.01 USEC.  
5220 DELAY  
F-WINDOW ON  
INTERPOLATING  
X ACTIVE

M A G N I T U D E F F T

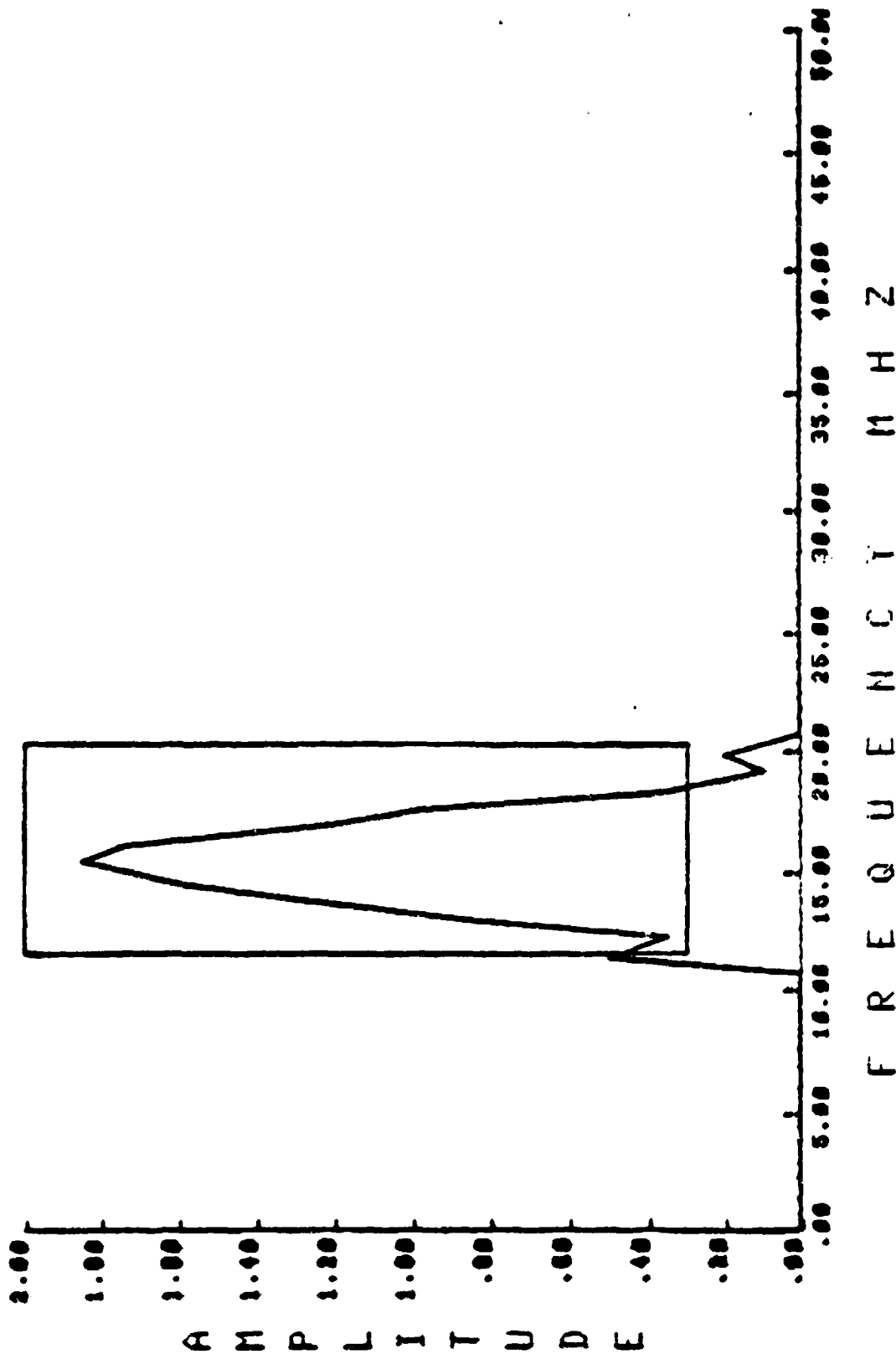


Figure 2-25

# EXAMPLE OF THE USE OF WINDOW MODE

PAUSE

.01 USEC.  
5220 DELAY  
F-WINDOW ON  
INTERPOLATING

I N U E R S E F F T



USECONDS

Selection of type 0 will cause one frame of data to be collected, the FFT to be calculated and plotted, the terminal to be initialized for graphic input, and prompt messages to be displayed. The operator may define up to eight windows. After each window is defined, the display is updated and only the portions of the FFT which are within the range of a window are plotted. Upon leaving WINDOW mode, only the portions of the FFT within the defined windows are processed by the Inverse FFT function.

Accurate window placement is possible by using the EXAMINE FFT function in conjunction with the WINDOW function.

Windows are automatically deleted when ZOOM is requested. Individual windows are deleted in WINDOW mode by identifying a window corner with the crosshair and pressing "DELETE" on the keyboard. Figures 2-19 through 2-26 are examples of the use of frequency WINDOW modes.

## 2.8.2 Time Windows

When window type 1 is selected, the system calls upon the time window placement routines to accept entry and deletion of windows in the raw data. This group of subroutines provides the capability to apply special processing to selected portions of the raw data in real time. The operator is allowed to enter points using the joystick and keyboard to define the region and type of processing to be performed. The requested processing is then done by other modules which reference the time window data in common. This system may be easily expanded to provide input for any new time windowed functions to be added in the future. The windows presently provided are:

<u>Type No.</u>	<u>ID</u>	<u>Description</u>
0	N/A	Inactive window
1	@	Any - Out (AO) alarm window
2	-	No - Out (NO) alarm window
3	R	Recording Window
4	T	Raw data threshold window
5	F	Front surface window
6	P	Peak-In (PI) alarm window

A detailed description of the function of each of these time windows is found on the following pages.

#### Type 0: Inactive Window

Type zero windows exist merely to fill up the unused window slots in the data structure to inhibit the plotting of spurious and meaningless windows.

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#### Type 1: Any - Out (AO) Alarm Window

The AO alarm window, like the other alarm windows, is processed by the routine SEARCH. When any data point within the domain of an AO alarm window falls outside of the limits set as the range of the window, an alarm flag is set and a point is set in the display, indicating a flaw at the coordinates from which this data was collected. If recording is selected, the setting of the alarm flag causes recording to take place. Figure 2-29 demonstrates placement of the AO (@) window.

#### Type 2: No - Out (NO) Alarm Window

The NO alarm window is processed in the same manner as the AO window above. In this case, the alarm flag is set if no data point in the domain of the window falls outside the range of the window. This window is typically used to detect the loss of back surface return. Figure 2-30 shows placement of the NO (-) window.

#### Type 3: Recording Window

This window is used to define the time domain of the data to be recorded. When recording has been selected and the alarm flag is set, the data within the time limits of the recording window is recorded. The range of this window (the Y-axis of the display) has no effect on its function and is retained only for the purpose of displaying the window.

#### Type 4: Raw Data Threshold Window

The raw data threshold window is processed by the sub-routine RDT. It functions only to effect the displayed data and does not act as an alarm window. Any data point within the domain of this window which does not exceed the upper limit of the window (the high Y-limit on the display) is set equal to the upper limiting value. This simulates a function of conventional ultrasonic equipment, and is intended for use in the no-scan or point scan modes. Figures 2-32 and 2-33 show the use and effect of the threshold window.

# USE OF THE TIME WINDOWS

TIME WINDOWS - INPUT WINDOWS USING JOYSTICK  
 SELECT WINDOW TYPE WITH KEY USED TO ENTER CORNER OF WINDOW  
 VALID KEYS ARE Q, -, R, I, P, D AND F  
 PRESS 'DELETE' TO DELETE WINDOW  
 WINDOW WILL FLASH - REJECT BY PRESSING SPACE D A T A  
 OR ACCEPT BY PRESSING 'DELETE' AGAIN

.01 USEC.  
 1040 DELAY

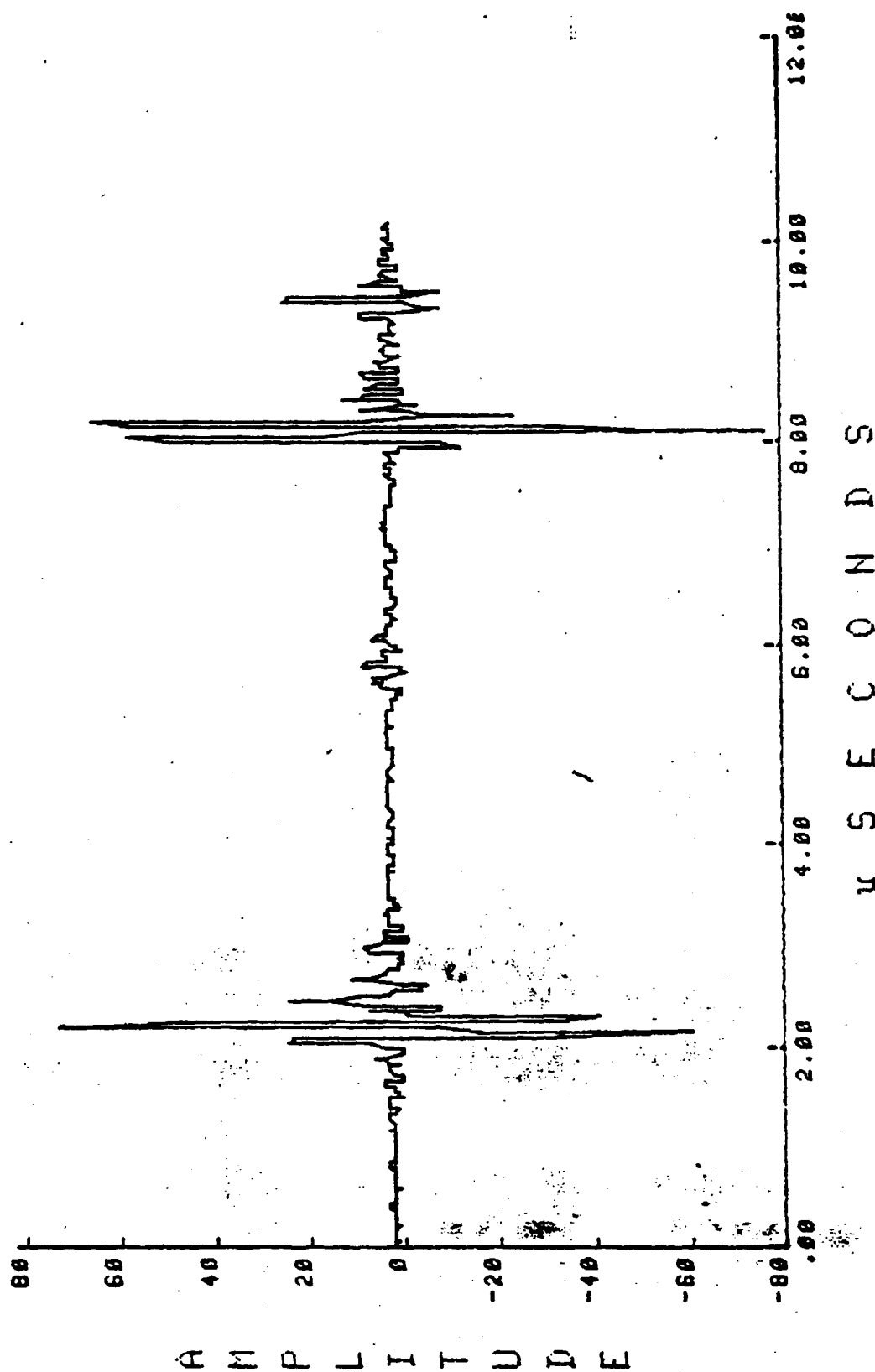
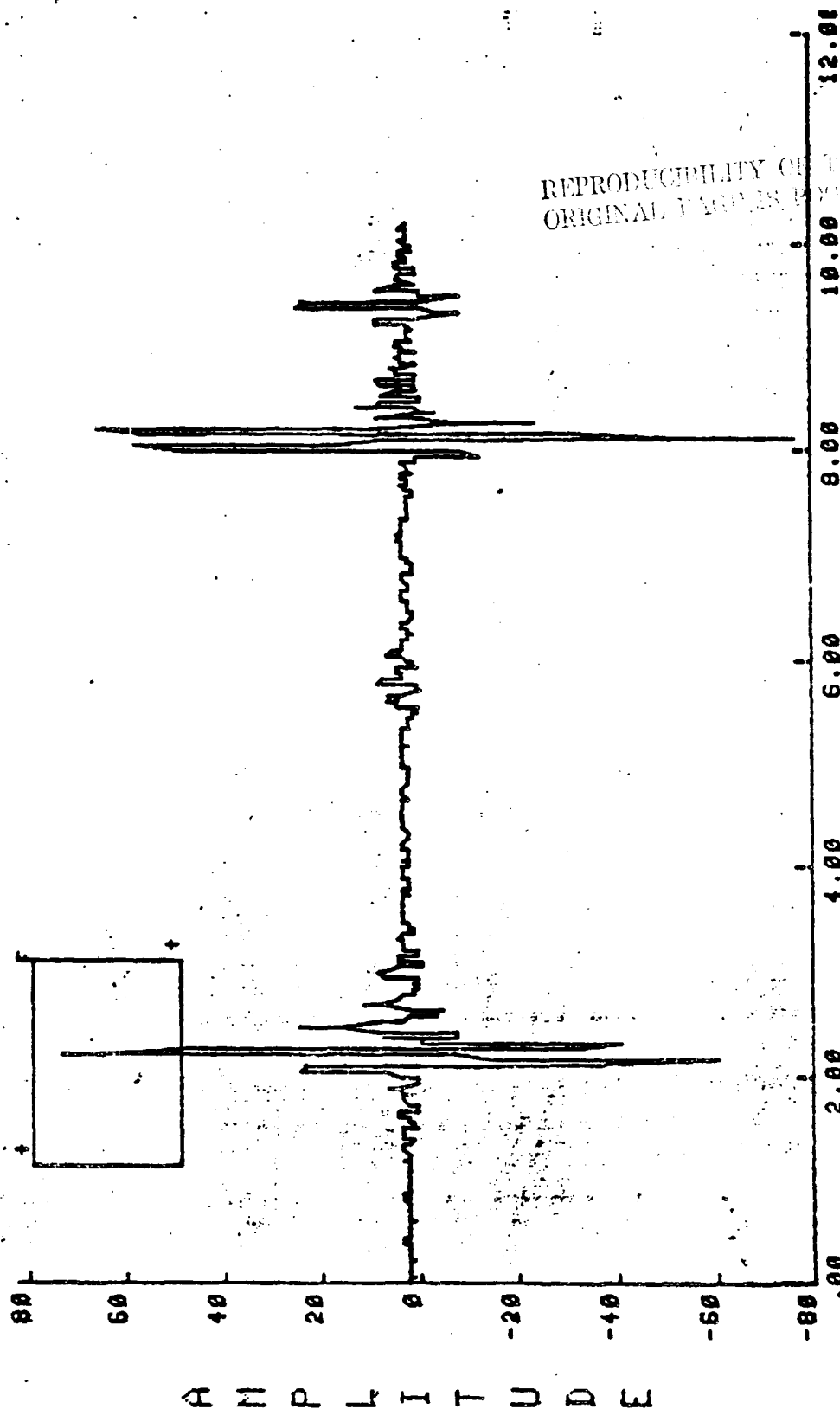


Figure 2-27

# PLACEMENT OF THE FRONT SURFACE WINDOW

TIME WINDOWS - INPUT WINDOWS USING JOYSTICK  
 SELECT WINDOW TYPE WITH KEY USED TO ENTER CORNER OF WINDOW  
 VALID KEYS ARE O, -, R, T, P, D AND F  
 PRESS 'DELETE' TO DELETE WINDOW  
 WINDOW WILL FLASH - REJECT BY PRESSING SPACE A T A  
 OR ACCEPT BY PRESSING 'DELETE' AGAIN

.01 USEC.  
 1040 DELAY



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Figure 2-20

# USE OF THE "AO" ALARM WINDOW

TIME WINDOWS - INPUT WINDOWS USING JOYSTICK  
 SELECT WINDOW TYPE WITH KEY USED TO ENTER CORNER OF WINDOW  
 VALID KEYS ARE O, -, R, T, P, D AND F  
 PRESS 'DELETE' TO DELETE WINDOW  
 WINDOW WILL FLASH - REJECT BY PRESSING SPACED A T A  
 OR ACCEPT BY PRESSING 'DELETE' AGAIN

.01 USEC.  
 1040 DELAY

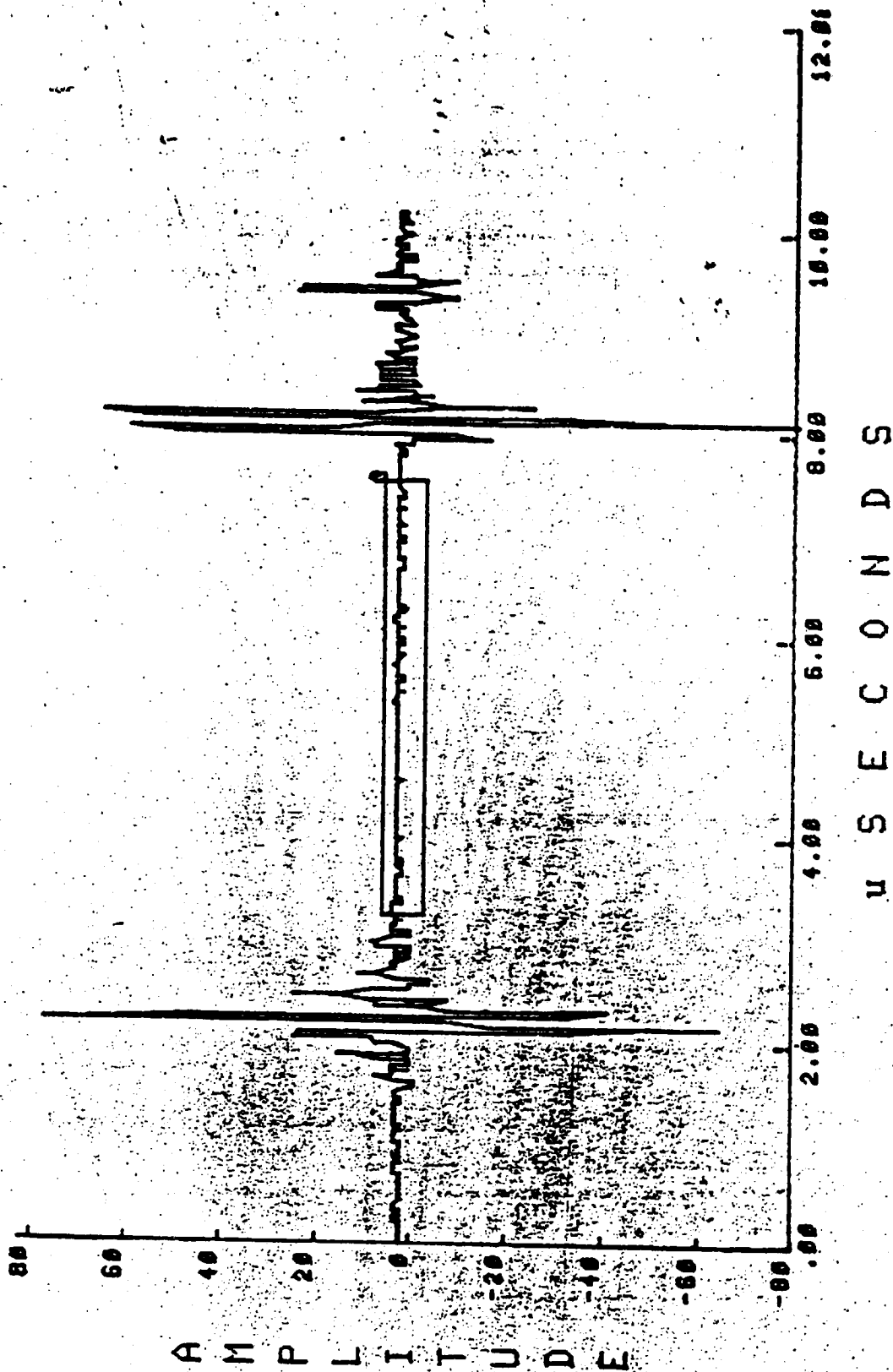
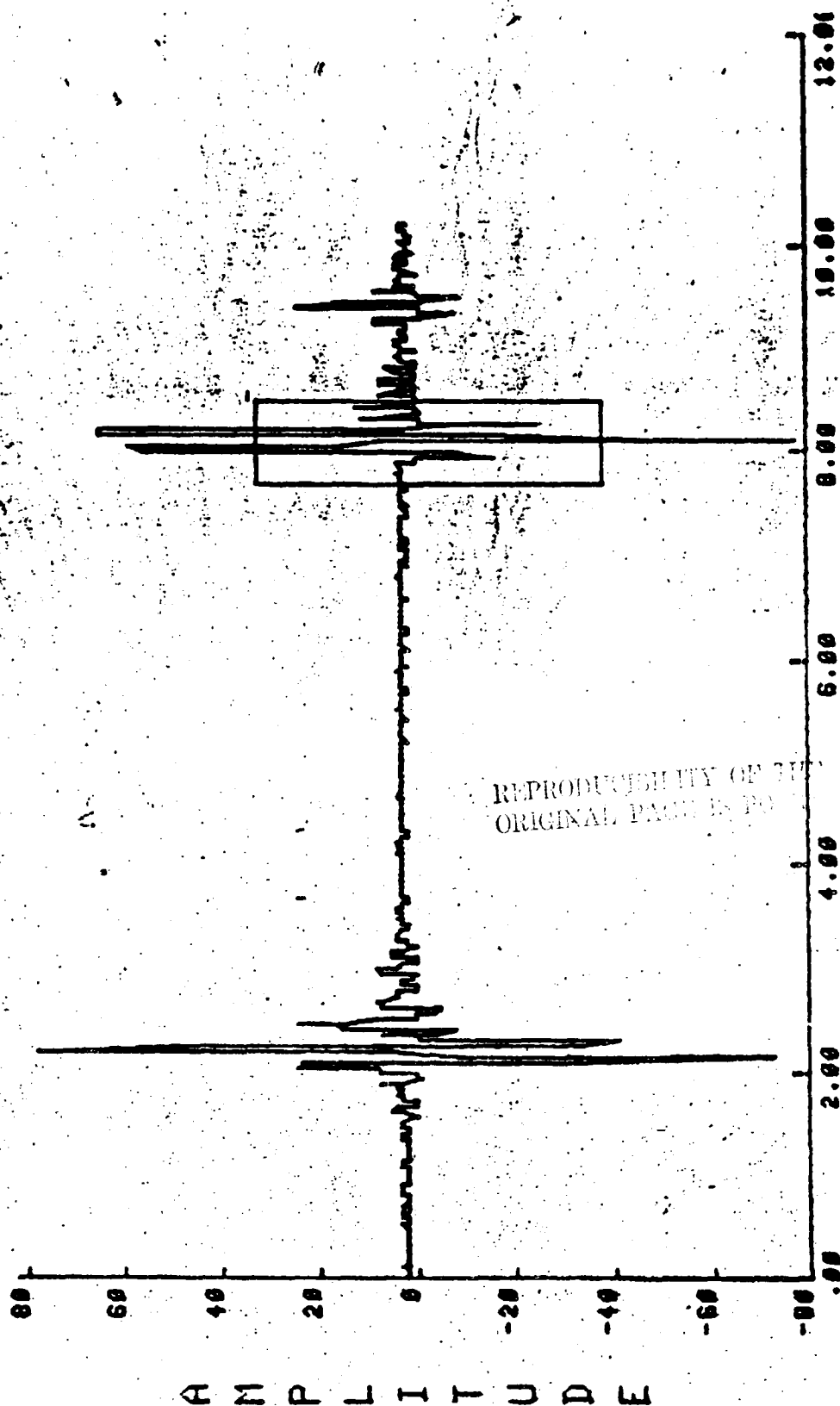


Figure 2-29

# PLACEMENT OF THE "NO" ALARM WINDOW

TIME WINDOWS - INPUT WINDOWS USING JOYSTICK  
 SELECT WINDOW TYPE WITH KEY USED TO ENTER CORNER OF WINDOW  
 VALID KEYS ARE Q, R, T, P, D AND F  
 PRESS 'DELETE' TO DELETE WINDOW  
 WINDOW WILL FLASH - REJECT BY PRESSING SPACED A T A  
 OR ACCEPT BY PRESSING 'DELETE' AGAIN

.01 USEC.  
 1040 DELAY

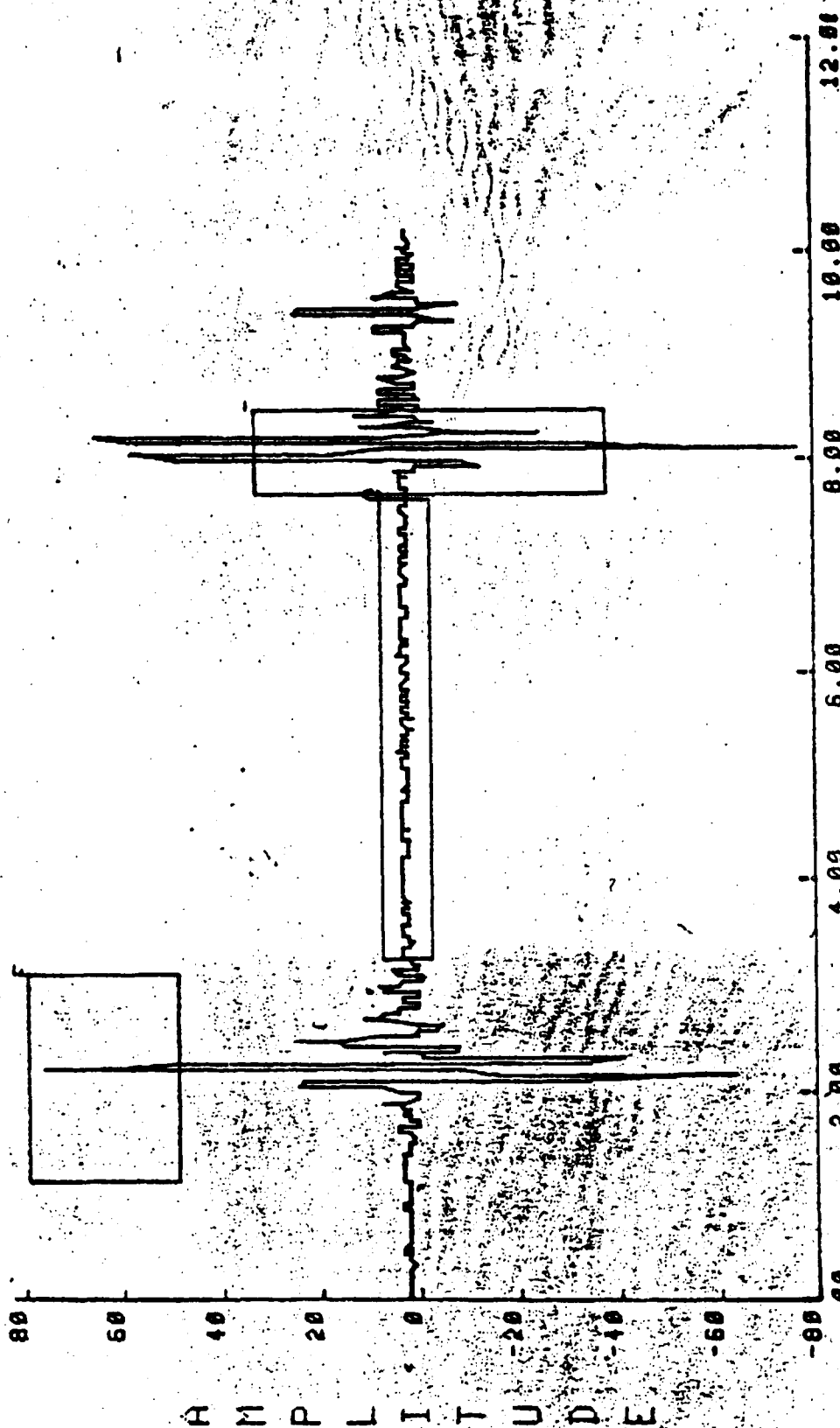


U S E C O N D S

# USE OF THE TIME WINDOWS

TIME WINDOWS - INPUT WINDOWS USING JOYSTICK  
 SELECT WINDOW TYPE WITH KEY USED TO ENTER CORNER OF WINDOW  
 VALID KEYS ARE O, -, R, I, P, D AND F  
 PRESS 'DELETE' TO DELETE WINDOW  
 WINDOW WILL FLASH - REJECT BY PRESSING SPACE AT A  
 OR ACCEPT BY PRESSING 'DELETE' AGAIN

.01 USEC.  
 1040 DELAY



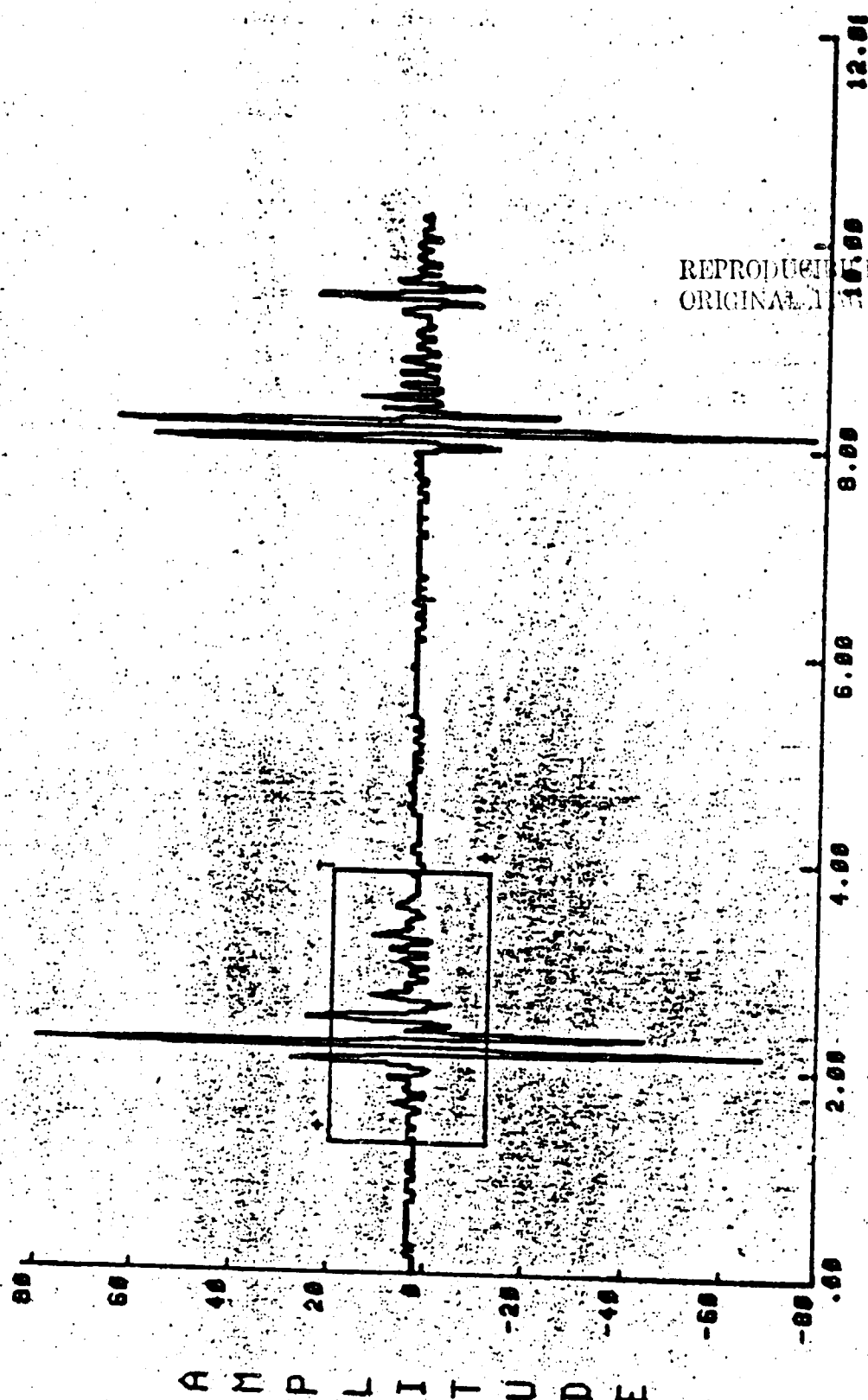
U S E C O N D S

Figure 2-31

# PLACEMENT OF THE THRESHOLD WINDOW

TIME WINDOWS - INPUT WINDOWS USING JOYSTICK  
 SELECT WINDOW TYPE WITH KEY USED TO ENTER CORNER OF WINDOW  
 VALID KEYS ARE G, -, R, T, P, D AND F  
 PRESS 'DELETE' TO DELETE WINDOW  
 WINDOW WILL FLASH - REJECT BY PRESSING SPACE A T A  
 OR ACCEPT BY PRESSING 'DELETE' AGAIN

.01 SEC.  
 1040 DELAY



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Figure 1-33

# EFFECT OF THE THRESHOLD WINDOW

TYPE WINDOWS - INPUT WINDOWS USING JOYSTICK  
 SELECT WINDOW TYPE WITH KEY USED TO ENTER CORNER OF WINDOW  
 VALID KEYS ARE Q, R, T, P, D AND F  
 PRESS 'DELETE' TO DELETE WINDOW  
 WINDOW WILL FLASH - REJECT BY PRESSING SPACE A T A  
 OR ACCEPT BY PRESSING 'DELETE' AGAIN

.01 USEC.  
 1040 DELAY

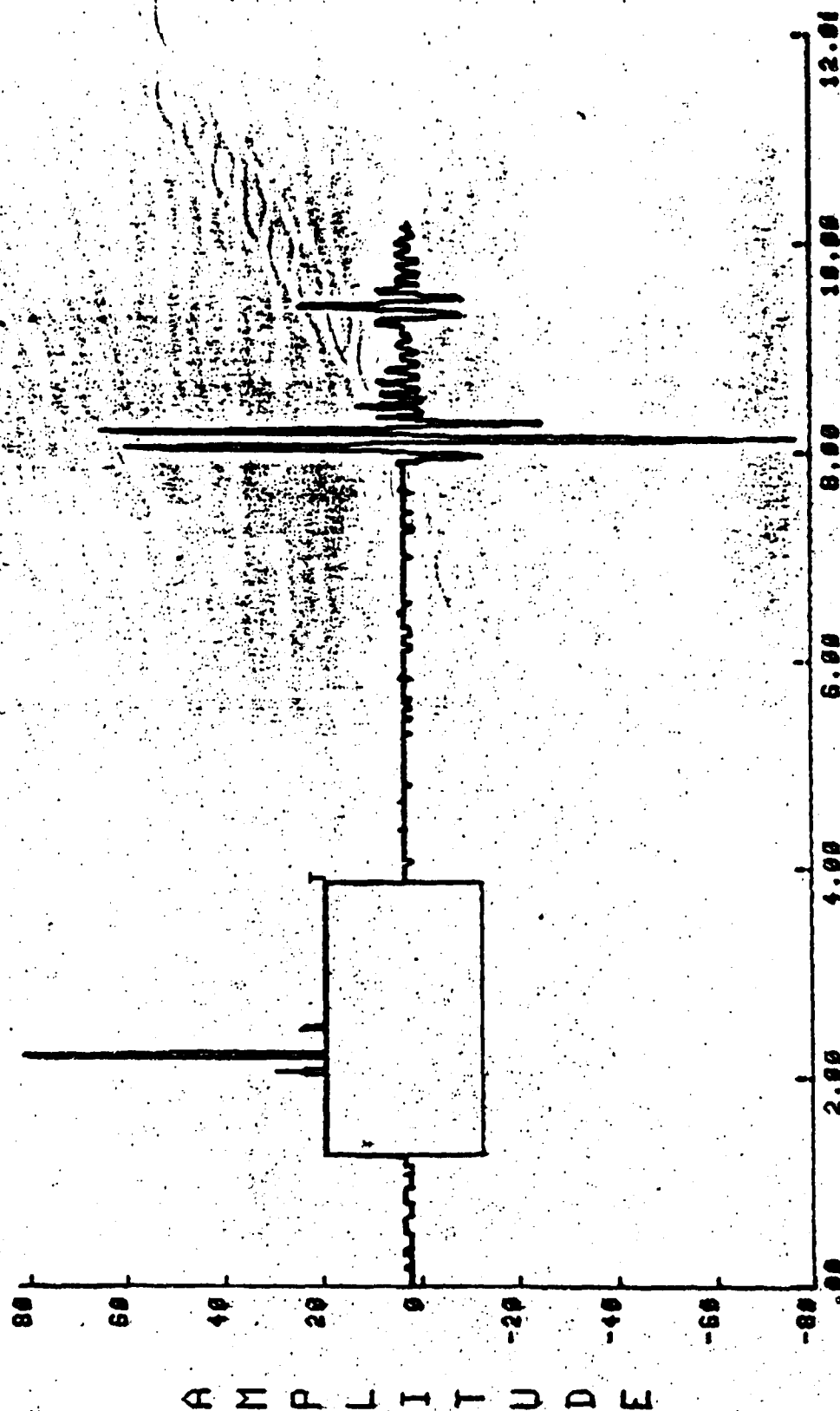


Figure 2-33

#### Type 5: Front Surface Window

The front surface window is processed by SEARCH to provide the capability of scanning a nonlevel specimen. The processing of this window results in an offset being applied to all time windows sufficient to cause the highest value in the domain of the front surface window to fall in the center in the domain of that window. If no data point within the domain of the front surface window exceeds the lower threshold of its range (the low Y-value on the display), the time window offset is not altered. This provides protection against the erroneous movement of the time windows if the front surface return is momentarily lost due to a hole in the upper surface of the specimen or to scanning off the edge of the specimen. Figure 2-28 demonstrates placement of the F window.

#### Type 6: Peak-In (PI) Alarm Window

The PI alarm window is processed in the same manner as the AO and NO alarm windows. If the highest data value within the domain of this window falls between the range limits of the window, the alarm flag is set.

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#### 2.8.3 Use of Time Windows

Proper use of the time windows is essential for effective system operation. All time windows except the raw data threshold window are processed in the real-time data loop when a scan is being performed. Windows should be used as sparingly as possible if fast operation is desired. No more windows should be placed than are necessary to accommodate the desired functions. The windows which are placed should be as short (on the time axis) as possible.

The time window type is given by the key used to enter the first point defining the window. A window may be deleted by placing the crosshairs within the window and pressing "DELETE". A window in which the cursor is located will be flashed. If the wrong window is flashed, the deletion may be rejected by pressing any key other than "DELETE". If the cursor is within several windows, the first one flashed may not be the one whose deletion is desired. Simply reject flashed windows until the correct one is flashed and then press "DELETE" a second time to accept that window for deletion.

## 2.9 Recording

When the system is prepared for primary option selection and "R" is pressed on the control terminal, the recording status is displayed, followed by the recording control option list.

```
R
SELECT RECORDING OPTION
0 - TURN ON RECORDING
1 - TURN OFF RECORDING
2 - CLOSE ACTIVE FILE AND TURN RECORDING OFF
3 - OPEN NEW FILE
4 - RETURN TO CONTROL DISPLAY
```

If "0" is pressed at this point, recording is turned on. Before this is done, a file should have been opened.

Selection of the "1" option will turn recording off. If a file is open it remains open.

Selection of option "2" will cause the active file, if any, to be closed and recording to be turned off.

Selection of option "3" will cause the file option display to be shown on the terminal.

```
3
SELECT FILE OPTION
0 - DEFAULT FILE TO "SCRTCH.DAT"
1 - ENTER FILENAME
2 - USE PREVIOUS FILENAME OF . . .
```

Option 2 appears only if a filename has been previously specified in this run. If either option 0 or 2 is selected, an attempt is made to open the file on DK1. If option 1 is chosen, the system responds with:

ENTER FILENAME

The user should then enter the name of the file in which the data is to be recorded. The filename format is NNNNNN.XXX. No device name may be entered. The extension (XXX) must be three characters long and would normally be ".DAT". When the last character of the extension is entered, an attempt is made to open the file. In each of the above cases, when an attempt is made to open a file, a check is first made to see if a file by that name already exists. If the file exists, a message to that effect is displayed and the operator is asked if the existing file should be deleted. If the answer is not "Y", the filename is rejected and another filename is requested by returning the user to the file option display.

Selection of option "4" will cause the primary option list to be displayed and terminates recording setup.

## 2.10 Special Function Keys

Three keys on the Tektronix terminal perform special functions which are essentially independent of the option list displayed on the terminal and the current activities of the task.

<u>Key</u>	<u>Description</u>
ESCAPE	Causes the current activity to be interrupted and the primary option list to be displayed.
Cntrl Q	Sends a "stop scanner" command to the LSI-11. If in the midst of a scan, the remainder of the row will be skipped and processing will continue on the next row.
Cntrl R	Sends a "reset" to the LSI-11. Any active scan command is aborted.

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*Note 1: Cntrl Q and Cntrl R cannot transmit the indicated scan command when some other communication is in progress. It may be necessary to press them several times to get the indicated result.*

*Note 2: If an "encode on reset" command has been issued (to allow entry of corners of scan), pressing CNTRL Q will have the same effect as pressing the reset button on the remote control unit.*

### 3. USE OF THE TRANSDUCER CHARACTERIZATION TASK (XC)

XC provides the capability to acquire ultrasonic echo data from a one-inch square area at maximum resolution and to display this data in contour line form. It is intended to be used to scan a point reflector (small steel ball) to produce plots of transducer beam intensity in a plane. Using this system, the operator can:

- Perform an X-, Y-scan of a one-inch square region with an increment of ten thousandths of an inch.
- Place and delete a time window to select that portion of the signal which is to be processed.
- Display all or part of the raw signal data from a single point.
- Display contour line plots of 30, 50, 70, and 90 percent of peak signal.

When XC is executed on the PDP 11/45, the XC control display will appear on the Tektronix terminal. From this terminal, the operator may select any of the control options at any time by selecting the appropriate character. The following are the control options currently available:

- S = SCAN - Set up data acquisition
- D = DISPLAY - Selects plot type.
- Z = ZOOM - Adjust delay, sample interval and display limits for signal.
- W = WINDOW - Place time window to select portion of signal to be processed.
- T = TRIGGER - Set trigger criteria for Biomation.
- I = INPUT CONTROL - Set Biomation input range parameters.
- B = BALL IDENTIFICATION - Accept ball I.D. for use on plots.
- X = TRANSDUCER IDENTIFICATION - accept transducer identification number for plots.
- E = EXIT - terminate system operation.
- P = PAUSE - Hold current display.
- G = GO - Begin or continue processing.

### 3.1 TRIGGER Control

See Section 2.1.

### 3.2 ZOOM Control

See Section 2.2.

### 3.3 SCAN Control

XC provides two sources for data to be processed and displayed. The data source may be specified by pressing "S" on the control terminal. The operator will then be prompted to select a data source.

S  
SCANNER CONTROL:  
SELECT INPUT SOURCE  
1 = REAL TIME DATA  
2 = RECORDED DATA

#### 3.3.1 Real Time Data

Selection of the REAL TIME DATA option (1) in response to the scanner control option display specifies that the data come from the ultrasonic transducer. The pulser unit should be turned on and set to external trigger mode on its front panel. (Refer to Appendix Q for details of pulser and receiver setup.) A second option display is generated:

1  
SELECT REAL TIME MODE  
0 = NO SCAN  
1 = SCAN

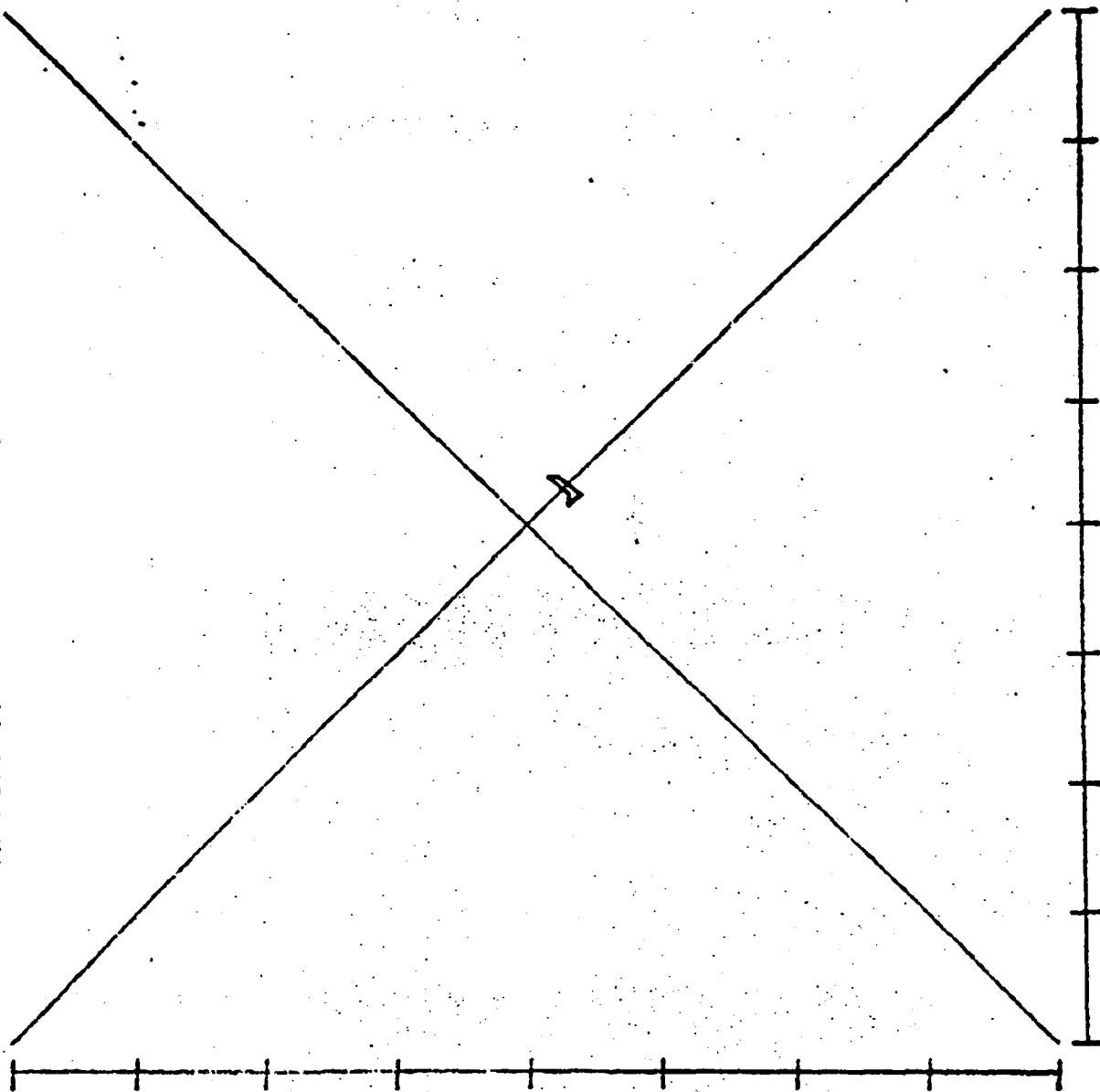
Selection of the NO SCAN option (0) from this display causes the probe to remain stationary and a new signal to be acquired from the same point for each display cycle. Selection of the SCAN option (1) causes the display of the following message:

POSITION SCANNER DIRECTLY OVER BALL  
PRESS RESET TO SEND COORDINATES  
BELL WILL SOUND

The operator should follow these instructions to enter the center of the scan. The remote control unit is used to position the scanner.

CONTOUR PLOT OF 99,  
TRANSDUCER A

PERCENT SIGNAL  
BALL 1/4 IN



DATE  
23-OCT-79

COORDINATES  
OF CENTER  
X= 4361  
Y= 10182  
Z= 1909

WINDOWED  
DISTANCE  
FROM XDUCER  
91.070IN.

Figure 3-1

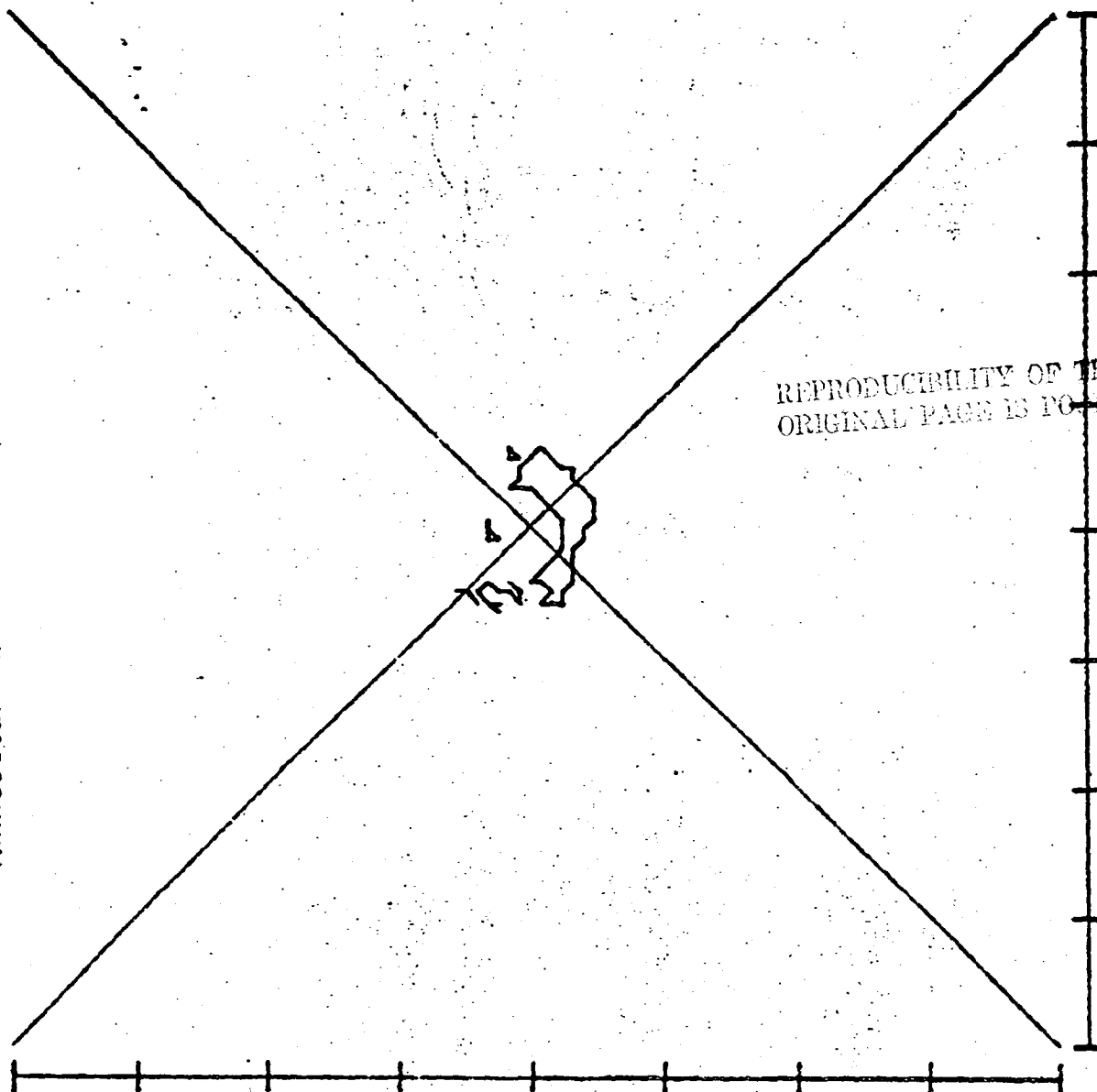
CONTOUR PLOT OF , 70  
TRANSDUCER A

PERCENT SIGNAL  
BALL 1/4 IN

DATE  
23-OCT-79

COORDINATES  
OF CENTER  
X= 4361  
Y= 10182  
Z= 1999

WINDOWED  
DISTANCE  
FROM XDUCER  
01.070IN.



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Figure 3-2

CONTOUR PLOT OF , . 50. PERCENT SIGNAL  
TRANSDUCER A BALL 1/4 IN

DATE  
23-OCT-79

COORDINATES  
OF CENTER  
X= 4361  
Y= 10182  
Z= 1909

WINDOWED  
DISTANCE  
FROM XDUCER  
01.070IN.

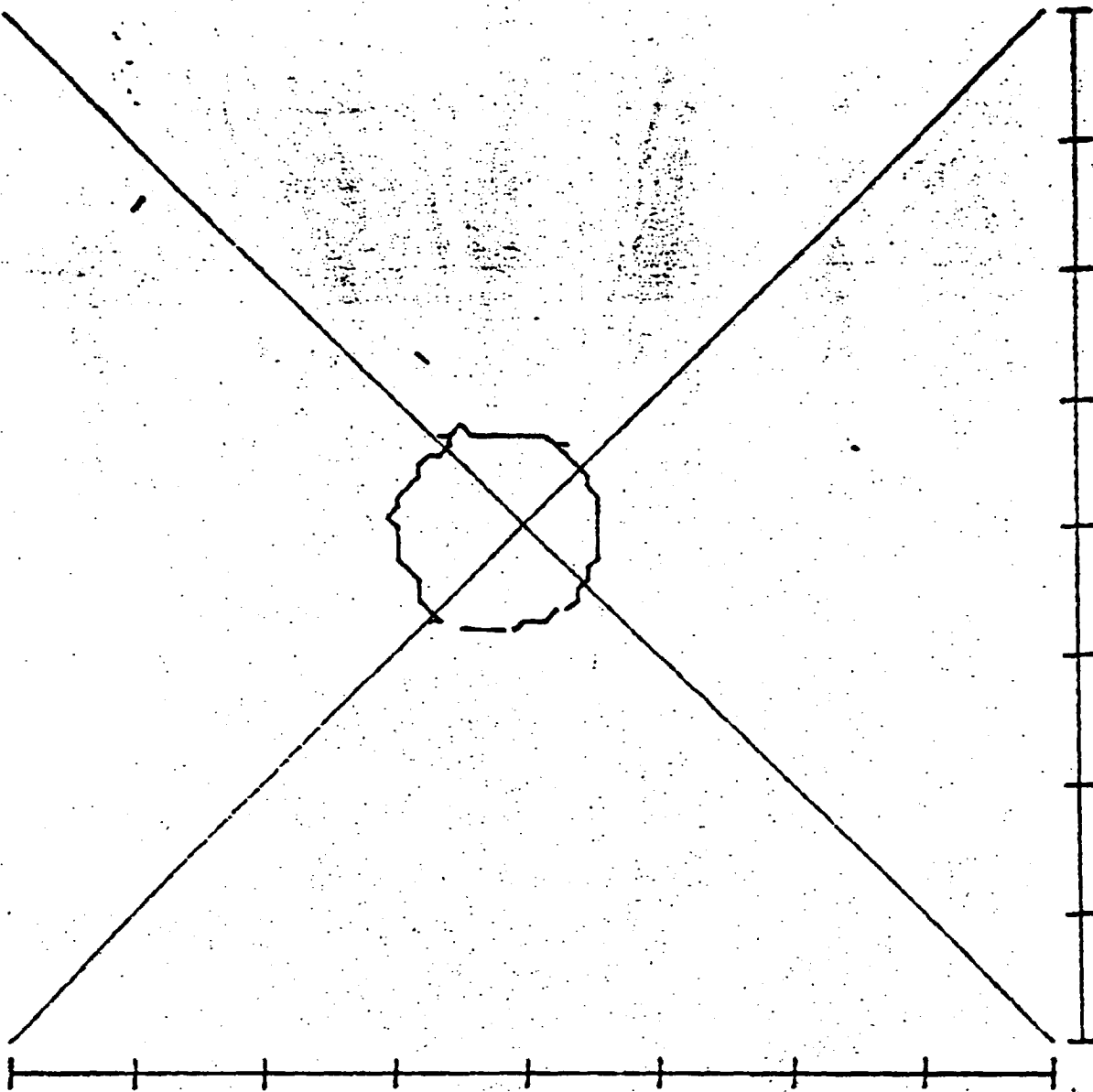


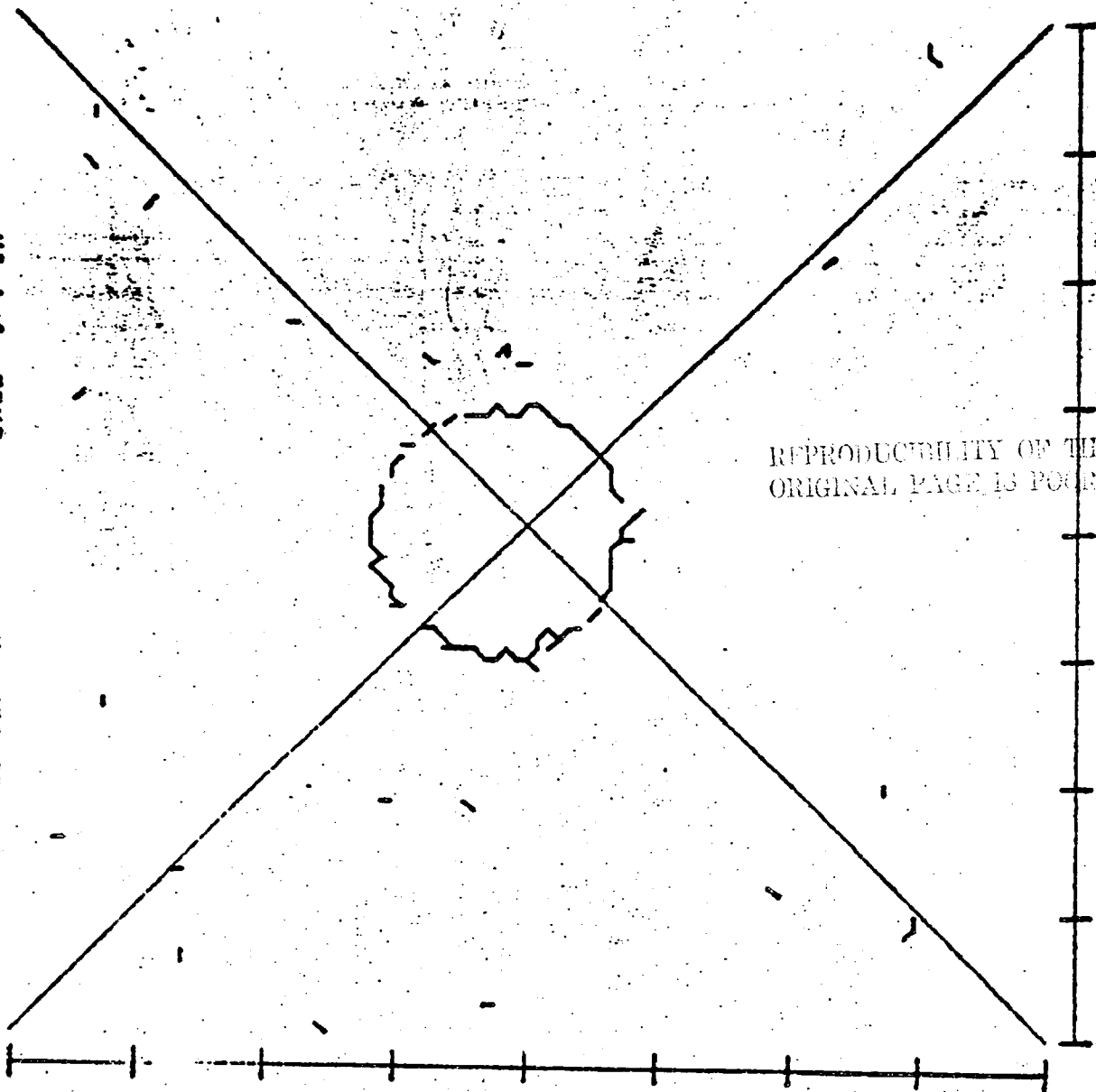
Figure 3-3

CONTOUR PLOT OF  
TRANSDUCER A  
AND 30 PERCENT SIGNAL  
BALL 1/4 IN

DATE  
23-OCT-79

COORDINATES  
OF CENTER  
X= 4361  
Y= 10182  
Z= 1909

WINDOWED  
DISTANCE  
FROM XDUCER  
01.070 IN.



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CONTOUR PLOT OF 90, 70, 50, AND 30 PERCENT SIGNAL  
TRANSDUCER A BALL 1/4 IN

DATE  
23-OCT-79

COORDINATES  
OF CENTER  
X= 4361  
Y= 10102  
Z= 1909

WINDOWED  
DISTANCE  
FROM XDUCER  
01.070 IN.

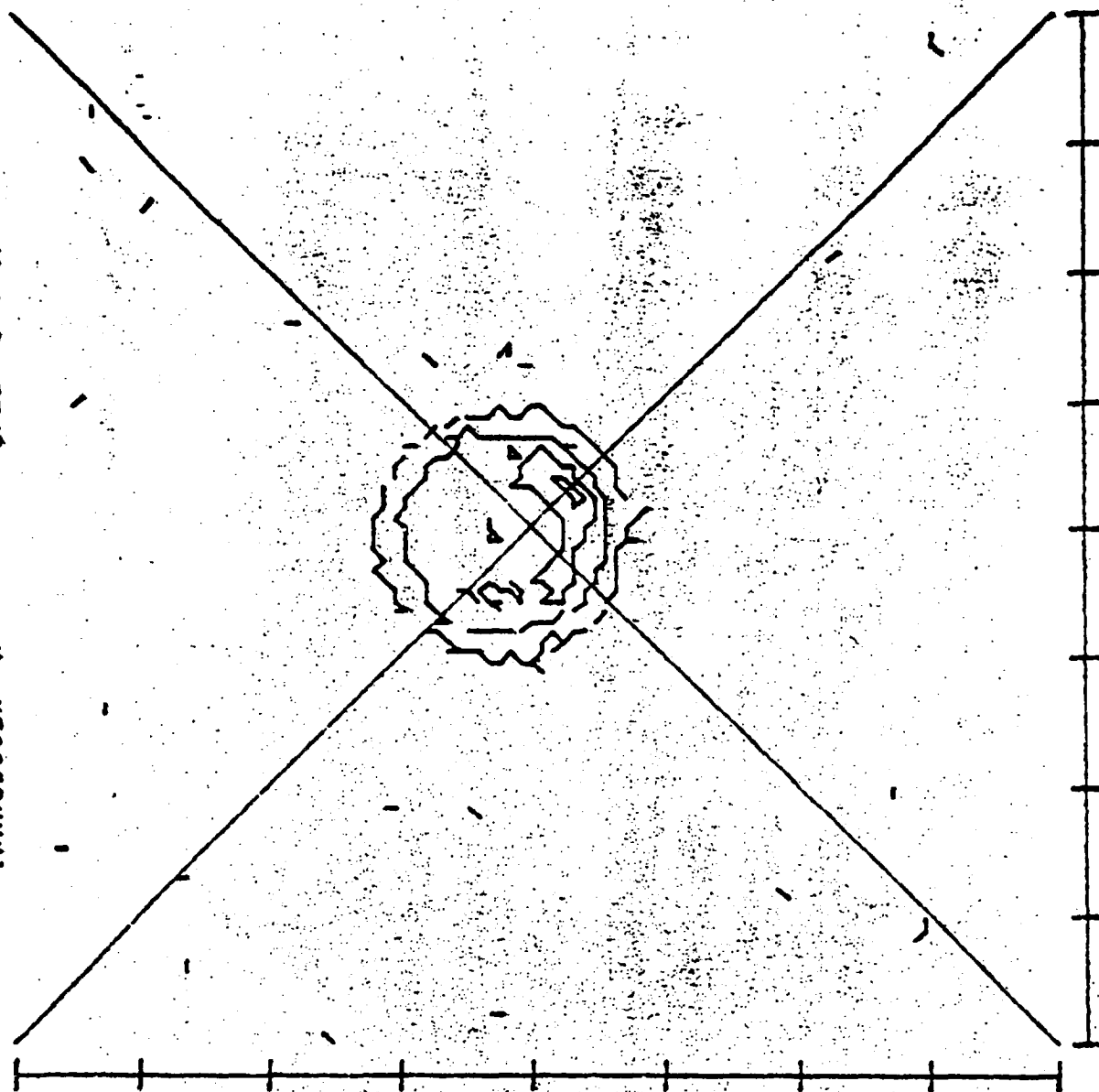


Figure 3-5

### 3.3.2 Recorded Data

Processing of recorded data is not currently supported. Selection of option "2" from the scanner control option list causes no action to be taken and should not be used.

### 3.4 DISPLAY Control

There are two graphic displays available within the XC system. The operator may choose a display by pressing "D" on the control terminal. The Display Control option list is put up on the terminal:

```
D
DISPLAY CONTROL INITIATED
SELECT DISPLAY TYPE
0 = RAW DATA
1 = TOTAL SCAN
```

Selection of option "0" causes the raw signal data to be displayed on each display cycle. This is primarily used to facilitate setup procedures. (See Figure 2-10 for example of raw data display). Selection of option "1" causes the contour plot display of the total scan to be displayed at the completion of a scan. The operator is asked to specify labeling procedure when total scan has been selected.

```
1
SELECT LABELING OPTION
0 - LABEL ALL LINES
1 - OMIT LABELS ON ISOLATED POINTS
2 - OMIT LABELS
```

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The selected labeling conversion will apply to the contour line plots. Figures 3-1 through 3-5 are contour line plots from a two-inch focus transducer.

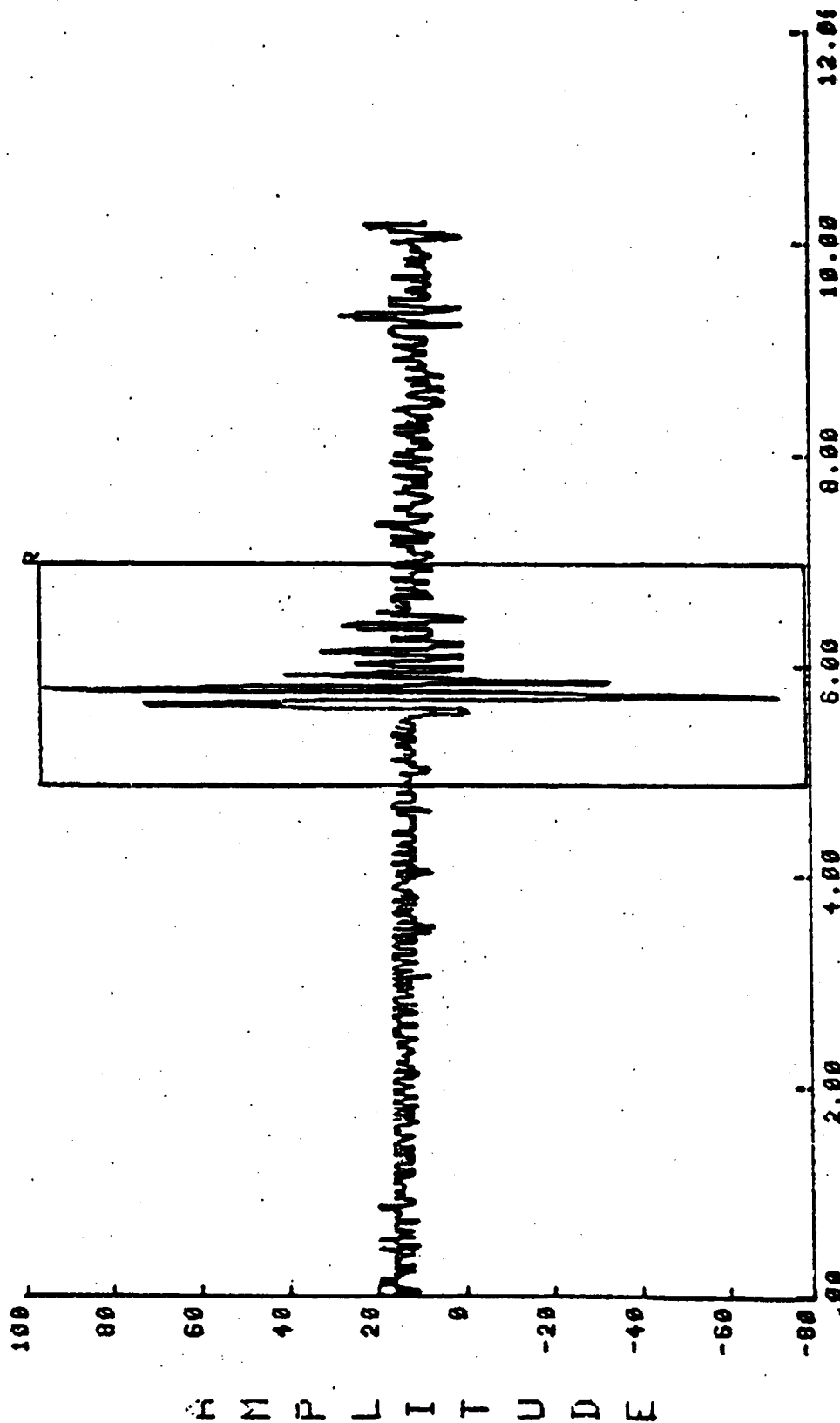
### 3.5 Windows

When "W" is pressed on the control terminal in response to the preimary option display, the system calls upon the time window placement routines to accept entry and deletion of windows in the raw data. (See section 2.8.2 for details of window entry and deletion). Although all window types may be placed, the only window processed by XC is the "R" window. This window should be placed so that it encloses the front surface return from the ball. Prior to placement of the window, ZOOM should be used to zoom in on the front surface signal. Figure 3-6 shows correct placement of the "R" window.

# USE OF THE 'R' WINDOW

TIME WINDOWS - INPUT WINDOWS USING JOYSTICK  
 ENTER TWO OPPOSITE CORNERS USING KEY FOR DESIRED WINDOW TYPE  
 VALID WINDOW TYPES ARE 0, -, R, T, F, P, AND D  
 PRESS 'R' FOR RECORDING WINDOW  
 PRESS 'D' FOR NEW DISPLAY WINDOW  
 PRESS 'DELETE' TO DELETE WINDOW  
 ONLY THE RECORDING WINDOW IS USED

.01  $\mu$ SEC.  
 2930 DELAY



U S E C O N D S

Figure 3-6

### 3.6 Input Control

Input control parameters may be specified by pressing "I" on the control terminal. The system responds with a series of options to allow the operator to select:

- Manual or Digital control of recorder channel A.
- Input coupling OFF/AC/DC.
- Input Range.
- Input auto-ranging OFF/ON.

Auto-ranging causes the input range to be changed whenever the peak in the "R" window exceeds 110. (out of 127.), or falls below 30.

### 3.7 Ball Identification

When "B" is pressed on the control terminal, the system responds with a message soliciting the input of a six character ball I.D. This is used on the contour plots and will be recorded with scan data when recording capability is developed.

### 3.8 Transducer Identification

When "X" is pressed on the control terminal, the system solicits the input of a transducer I.D. This is shown on the contour plots and will be recorded with scan data.

### 3.9 Special Function Keys

See section 2.10.

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#### 4.0 USE OF DATA INDEXING AND EXTRACTION SYSTEMS (DIND/PEX)

The Data Indexing (DIND) and Point Extraction (PEX) systems provide essential utility services to post-processing programs which access the recorded signal data. DIND generates an index of the recorded data which is used by PEX to obtain particular signal samples for post-processing.

##### 4.1 DIND - Data Indexing System

The data indexing system was developed to provide an index of individual data points in the data file of a scan. This index is used by PEX to facilitate rapid location of requested data points. The structure of the index limits it to indexing 2880 points from a single scan.

When DIND is run, it returns a prompt. The user must enter a command string of the standard form:

DDD:NNNNNN.XXX=DD:NNNNNN.XXX

Where:

DDD is a device specification

NNNNNN is a filename

XXX is an extension

Default extensions are .DAT and .IND for the input and output files respectively. Default device is DK0 as usual. Examples:

\*A=A

Will generate an index file DK0:A.IND  
from the data file DK0:A.DAT.

\*DK1:B=DK1:B

Will generate an index file DK1:B.IND  
from the data file DK1:B.DAT.

##### 4.2 PEX - Point Extraction Subsystem

The point extraction subsystem was developed to provide an easily used system by which individual data points may be extracted from a recorded scan. This package will be used by programs which perform synthetic aperture processing, pattern recognition, and other data reduction tasks.

PEX provides two entry points which provide the capability to initialize the system and extract specified data points.

Entry point PEXI is called to initialize the point extraction system. Before PEXI is called, an index file generated by DIND should be opened on channel (or LUN) 3. If an invalid index file is supplied, or none, PEXI will print an error message on the console and exit. Warnings may be printed indicating other non-fatal errors. Upon return from PEXI, variables HXS, HYS, STYP and SINCR, described below, contain a description of the scan. The data file being read will be open on channel 2.

Entry point PEX is called to extract a single data point. The coordinates of the requested point must be specified in XS and YS prior to calling PEX. Upon return, DSTAT indicates whether or not the point was found. If DSTAT is zero, the requested data is in IBUF. TWDLY, FUPS, STARTX, and STOPX will contain updated values.

All data passed between the calling program and the PEX subsystem is passed in the common area EXDCOM. This common area is described in Table P-1.

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# EXDCOM

<u>Offset</u>	<u>Name</u>	<u>Description</u>
0	STYP	Scan type 0=aligned scan, 1=offset scan*
1	DSTAT	Data status 0=data found, >0=data not found, <0=error
2	XS	Requested X coordinate
3	YS	Requested Y coordinate
4	TWDLY	Number of time units between triggering of recorder (main bang) and start of IBUF.
5	FUPS	Duration of data sample (x 10ns.)
6	SINCR	Scan increment in thousandths of an inch
7	STARTX	Start of valid data in IBUF*
8	STOPX	End of valid data in IBUF**
9	HXS	High X of scan
10	HYS	High Y of scan
11-15	SPARES	
16	IBUF (2048)	Data Buffer, packed bytes

\* For offset scans, data in odd numbered rows is shifted up 1/2 increment.

\*\* Data before STARTX or after STOPX will be zero.  
 Note: Coordinates are specified relative to the origin of the scan in thousandths of an inch.

Table P-1

## Appendices

A	Primary Ultrasonics Task Module Descriptions
B	Primary Ultrasonics Task Common Descriptions
C	Primary Ultrasonics Task Listings
D	Transducer Characterization Module Descriptions
E	Transducer Characterization Common Descriptions
F	Transducer Characterization Listings
G	KSCN3 Module Descriptions
H	KSCN3 Common Descriptions
I	KSCN3 Listings
J	Data Indexing System Module Descriptions
K	Data Indexing System Common Descriptions
L	Data Indexing System Listings
M	Point Extraction System (PEX) Module Descriptions
N	Point Extraction System Common Descriptions
O	Point Extraction System Listings
P	Utility Programs
Q	Pulser Unit Set up

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Appendix A

PUT Module Descriptions

The primary ultrasonics task (PUT) consists of 62 program modules. Nine of these are described in the Elsytec MFFT-11 user's manual. Eight of these are in the Bioaction control routines package and are described elsewhere. The remaining 45 modules are described in this appendix. They are listed below in the order in which they will be described.

AVGR	Averages several signals collected at one point
B2AO	Binary to ASCII octal conversion
B81	Gets data from Bioaction 8100
BATDLY	Sends arm and trigger set up commands
BEGIN	Initializes common areas
BEGIN1	Initializes RCDCOM and enables interrupts
BSETUP	Bioaction set up routine
CALC	Performs calculations on signal data
CNTRL	Operator input and control routine
CONDSP	Console display routine
DISPLA	Displays data on graphics terminal
DSETUP	Recording setup routine
DUMP	Provides core dumps
FCLOSE	Closes files
FNAMIN	Inputs filenames
FPLOT	Function plot module
FWINDO	Frequency window input routine
IENCODE	Binary to ASCII decimal conversion
LSIINT	Interrupt service for LSI-11
MNS	Driver routine
PAXIS	Plot axis generation routine
PLTW	Plots time windows
PSCALE	Calculates plot parameters
RDT	Raw data thresholding
RECORD	Compresses and records signal data
RKMOD	Disk utility routines
S0	Source zero (simulated data) set up routine
S1	Source one (real-time data) set up routine
S2	Source two (recorded data) set up routine
SCAN	Sends scan commands to LSI-11
SCAND	Reads data from disk and expands it
SCNDSP	Displays scan results
SEARCH	Processes time windows
STUBS	Program stubs
TC	Trigger control
TEKMOD	Tektronix module
TWINDO	Time window input module
UNPACK	Packs and unpacks data
VIEW	Sets up subscans and point scans
WINT	Time window input routine
WPH	Writes point headers to disk
WRTRUF	Writes OUTBUF to disk
WSH	Writes scan headers
XAMIN	Zooms in and out on frequency data
ZOOM	Selects portion of raw data for display

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Module: AVGR - signal averaging

Language : Macro-11

Called By: MNS

Calling Sequence: CALL AVGR

External References: Commons

IBUF - incoming data common

Item	access	description
IBUF	r/w	Raw data buffer

NTRCOM - inter-module common

Item	access	description
MDATA	r/w	Accumulated data buffer
IREPT	r/w	Number of points to be averaged -1
REPKNT	r/w	Current point number

Functional Description:

When IREPT = 0, no action is taken. When IREPT  $\neq$  0 and REPKNT = 0, IBUF is transferred to MDATA. When IREPT  $\neq$  REPKNT and both are greater than zero 0, IBUF is added to MDATA. When IREPT = REPKNT  $\neq$  0, IBUF is added to MDATA which is then divided by IREPT+1 and placed in IBUF. This has the effect of averaging IREPT+1 points.

Module: B2AO - binary to ASCII octal conversion

Language: Macro-11

Called By: DUMP, DUMPXC

Calling Sequence: CALL B2AO(VALUE, OBUF)

where:

VALUE is the word to be converted

OBUF is the buffer where the 6 ASCII characters are to be placed.

Functional Description:

B2AO converts one 16 bit word into a 6 byte ASCII representation of the unsigned octal value of that word.

Module: B81

Language: Macro-11

Entry Point: B8100

Called By: SCAN, RTL

Callins Sequence: CALL B8100

External References: Commons

IBUF - incoming data common

Item	access	description
IDTM	ro	Data transfer mode
IERR	r/w	Return error code, negative if no error
IBUF	r/w	Raw data buffer

External References: I/O Registers

address	access	description
164040	r/w	CSR for Biomation interface
164042	wo	Control register
164044	wo	Word count register
164046	wo	Buffer address
164052	ro	Read data/status
272	wo	Program done interrupt status
274	wo	NPR done or error vector
276	wo	NPR done or error status

External References: Subroutines

name	description
FLGT	Tests flag bit in CSR for command acceptance

Functional Description:

B81 initiates the NPR data transfer from the Biomation 9100 waveform recorder. If single word transfer is requested, the data is sign extended by B81. If double word transfer is requested, the data is left in byte packed form.

Module: BATDLY - arm and trigger commands  
Language: Macro-11  
Entry Points: ADLY and TDLY  
Called By: BSETUP  
Calling Sequence: CALL ADLY(CTRGP,DLY1)  
                  or CALL TDLY(CTRGP,DLY1)  
Where: CTRGP is the control group  
       DLY1 is array of control parameters

Functional Description:

ADLY/TDLY sets the ARM/TRIGGER delay and level magnitude if these are selected for digital control.

Entry Points: ACMD and TCMD  
Called By: BSETUP  
Calling Sequence: CALL ADMD(CTRGP,MODE)  
                  CALL TCMD(CTRGP,MODE)  
Where: CTRGP is the control group mask  
       MODE is an array of control parameters

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Functional Description:

ACMD/TCMD sets the mode, source, input source and coupling for the ARM/TRIGGER signal to the Biomation. If these are not selected for digital control, this action has no effect.

Entry Points: ARM and TRIGGER  
Called By: BSETUP, PNE, SCAN  
Calling Sequence: CALL ARM  
                  CALL TRIGGER  
External References: I/O Registers  
address       access       description  
164042        wo        Commands to Biomation

External References: Subroutines

name	description
FLGT	Tests the flag bit in the control register for command acceptance

Functional Description:

ARM/TRIGGER sends an ARM/TRIGGER command to the Biomation which results in the arming or triggering of the unit regardless of the selected ARM/TRIGGER source.

Module: BEGIN

Language: Macro-11

Called By: MNS, CNTRL

Calling Sequence: CALL BEGIN

External References: Commons

SCNCOM - scan common

Item	access	description
SOURCE	wo	Data source
SRCHTP	wo	Search type
TX1	wo	Low X coordinate of total scan
TY1	wo	Low Y coordinate of total scan
TX2	wo	High X coordinate of total scan
TY2	wo	High Y coordinate of total scan
SBUF	wo	Subscan bit map of flaws
TBUF	wo	Total scan bit map of flaws
STATUS	wo	Status of scan
NUMPNT	wo	Maximum number of points on X axis of scan
DXMIN	wo	Minimum increment of scan

CALCOM - calculations common

Item	access	description
KOSINE	wo	Table of cosine values
FWND	wo	Frequency windows
FMD	wo	Window active flags

NTRCOM - inter-module common

Item	access	description
STARTX	wo	Beginning of data for display
STOPX	wo	End of displayed data
FSTART	wo	Beginning of frequency data for display
FSTOP	wo	End of frequency data for display
RENT2	wo	2nd option to be selected on reentry to CNTRL
FWACT	wo	Frequency windowing active flag
IACT	wo	Interpolation active flag

DSPCOM - display common

Item	access	description
DTYPE	wo	Display type
MINX	wo	Minimum of data domain
MAXX	wo	Maximum of data domain

ATPARA - Biomation common

Item	access	description
ADLY1	wo	MSD of arm delay
TDLY1	wo	MSD of trigger delay
ADLY2	wo	2nd digit of arm delay
TDLY2	wo	2nd digit of trigger delay
ALEV1	wo	MSD of arm level magnitude
TLEV1	wo	MSD of trigger level magnitude
ALEV2	wo	MSD of arm level magnitude
AMODE	wo	Arm mode Input/Auto
TMODE	wo	Trigger mode
ASRC	wo	Arm source
TSRC	wo	Trigger source
TSLOP	wo	Trigger slope

TCOUP	wo	Trisder coupling
ACNT	wo	Arm control
TCNT	wo	Trisder control
ASEL	wo	Channel A selected flag
BCNTR	wo	Channel B control
AAPC	wo	Channel A positive coupling
ABPC	wo	Channel B positive coupling
AAMC	wo	Channel A negative coupling
ABMC	wo	Channel B negative coupling
ARNG	wo	Channel A input range
ACHM	wo	Channel A mode Off/Input
BCHM	wo	Channel B mode
APOL	wo	Channel A polarity

IBUF - incoming data common

Item	access	description
IUTS	wo	Sample rate units
IRNG	wo	Sample rate range
ITYP	wo	Interrupt mode
IDTM	wo	Data transfer mode
MODE	wo	Output mode
IWDSTR	wo	Word start value
ISTREC	wo	Start recording value

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#### External References: Subroutines

name	description
SCST	Forms cosine table
BEGIN1	Initializes RCDCOM

#### Functional Description:

BEGIN sets common areas to their initial state.

Module: BEGIN1 - initializes RCDCOM

Language: Macro-11

Called By: BEGIN

Calling Sequence: CALL BEGIN1

External References: Commons

RCDCOM - recording common

Item	access	description
RON	wo	Recording on flag
FBPNTR	wo	File block pointer
FBUF	wo	File name buffer
FSTAT	wo	File status
FSTAT1	wo	Device full flag
CHNUM	wo	Active channel number
BLKNUM	wo	Current block number in file
THXCD	wo	Threshold exceeded flag
OBPNTR	wo	OUTBUF pointer
XDCRID	wo	Transducer Identification
SMPLID	wo	Sample Identification
READY1	wo	Buffer 1 busy flag
READY2	wo	Buffer 2 busy flag
BPNTN	wo	Buffer pointer
BUFEND	wo	End of active buffer
CRPNTR	wo	Completion routine pointer
RSTART	wo	Start of data to be recorded
RSTOP	wo	End of data to be recorded
OUTBUF	wo	Compressed data buffer.

DSPCOM - display common

Item	access	description
TWNDT	wo	Time window types
WTP	wo	Window type

External References: I/O Registers

address	access	description
344	wo	LSI-11 interrupt vector
346	wo	LSI-11 interrupt priority
167740	wo	CSR for LSI-11 interface

External References: Files/LUNS

LUN actions description

All \* All channels are purged by .SRESET

Functional Description:

BEGIN1 initializes RCDCOM and the time windows in DSPCOM. All interrupts are enabled and all channels purged.

Module: BSETUP - Biomation set up routine

Language: Macro-11

Called By: MNS

Calling Sequence: CALL BSETUP

External References: Subroutines

ATPARA - Biomation common

Item	access	description
All	ro	All ATPARA words are referenced by BSETUP to set up the Biomation

IBUF - incoming data common

Item	access	description
IUTS	ro	Sample duration units
IRNG	ro	Sample duration range
MODE	ro	Output mode of Biomation
ISTREC	ro	Start recording value
IEDREC	ro	End recording value

External References: Subroutines

name	description
SETCA	Set channel A input coupling
SETIA	Set channel A input offset
SETMA	Set channel A input mode
SETCB	Set channel B input coupling
SETIB	Set channel B input offset
SETMB	Set channel B input mode
OUTH	Set output mode
RECDM	Set record mode
ADLY	Set arm delay
ACMD	Set arm coupling, mode, source and slope
TDLY	Set trigger delay
TCMD	Set trigger coupling, mode, source and slope
ARM	Arms Biomation

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Functional Description:

BSETUP sets up the Biomation waveform recorder as indicated in the common area ATPARA. The unit is also armed.

Module: CALC - calculations routine

Language: Macro-11

Called By: MNS

Calling Sequence: CALL CALC

External References: Commons

IBUF - incoming data common

Item	access	description
IBUF	r/w	Raw data buffer

NTRCOM - inter-module common

Item	access	description
MDATA	r/w	Calculated data buffer
MD	r/w	Scaling factor for MDATA
STARTX	ro	Beginning of data for display
FWACT	ro	Frequency window active flag

CALCOM - calculation common

Item	access	description
KOSINE	ro	Table of cosine values
IFFT	ro	Inverse FFT flag
FWND	ro	Frequency windows

External References: Global Variables

Item	access	description
ACUMHI	wo	MFFT hardware register
ACUMLO	wo	MFFT hardware register
MWDCT	wo	Number of elements to process
CTABL	wo	Control table for Elsytec
TAD	wo	Temporary area address
LTMP	wo	Length of temporary area in bytes
INVFG	wo	Inverse FFT flag

External References: Subroutines

name	description
FN1	Calls Elsytec hardware functions
CFT	Performs forward and inverse FFTs
CTO	Converts for all-real data
CMCS	Calculates magnitudes of complex arrays

Functional Description:

CALC performs FFTs, inverse FFTs, and windowing calculations as requested by various common flags.

Module: CNTRL - system control module

Language: Macro-11

Called By: MNS

Calling Sequence: CALL CNTRL

External References: Commons

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer
LBLUP	ro	Label up flag

NTRCOM - inter-module common

Item	access	description
IEXIT	wo	Task exit request flag
RENT	r/w	1st option to be selected on reentry to CNTRL
STARTX	ro	Beginning of data for display in IBUF
STOPX	ro	End of data for display
RENT2	r/w	2nd option (suboption) to be selected on reentry to CNTRL
FWACT	wo	Frequency windowing active flag
SSACT	r/w	Same scan active flag
IREPT	r/w	Repeat count (total)
REPNT	wo	Current repeat count

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DSPCOM - display common

Item	access	description
DTYPE	r/w	Display type
MINX	r/w	Minimum of data range
MAXX	r/w	Maximum of data range
XLO	r/w	X axis minimum in data units
XHI	r/w	X axis maximum in data units
YLO	wo	Y axis minimum in data units
YHI	wo	Y axis maximum in data units
TWND	ro	Time windows
TWNT	ro	Time window types

CALCOM - calculation common

Item	access	description
IFFT	wo	Inverse FFT request flag

SCNCOM - scan common

Item	access	description
SOURCE	r/w	Data source
SRCHT	wo	Search type
STATUS	wo	Status of scan

RCDCOM - recording common

Item	access	description
WCHNUM	ro	Write channel number
RCHNUM	ro	Read channel number
RSTART	wo	Beginning of data in IBUF to be recorded
RSTOP	wo	End of data to be recorded

External References: Files/LUNS

LUN	actions	description
WCHNUM		Write channel (used in .WAIT)

RCHNUM     c            Read channel

External References: Subroutines

name	description
BEGIN	Initializes common areas
CHOUT	Outputs messages to terminal
DSETUP	Sets up for recording
DUMP	Provides core dumps
ERASE	Erases Tektronix screen
FCLOSE	Closes compressed data files
FWINDO	Frequency windowing routine
HOME	Homes cursor on terminal
S0	Source zero (simulated) setup routine
S1	Source one (real time) setup routine
S2	Source two (recorded) setup routine
TC	Trigger control routine
TWINDO	Time window input module
VIEW	Subscan definition
XAMIN	Adjusts viewing window for FFT
XDUCER	Get transducer characteristics
ZOOM	Adjusts viewing window for raw data

Functional Description:

CNTRL solicits and accepts input from the operator at the Tektronix terminal. All setup and control parameter input routines are called by CNTRL.

Module: CONDSP - console display routine

Language: Macro-11

Called By: any or all modules

Calling Sequence: CALL CONDSP

External References: Commons

CONDSP may access any word of any common in the system. Any address in memory may also be accessed.

Functional Description:

CNDSPX is a routine to display any desired data on the console while MNS is running. The condition of the switch register determines what is to be displayed. There are two modes of operation:

I. Common Mode

Bits 13-15 determine which common is to be displayed. These are listed below:

- 0) DBGCOM - Debug common
- 1) SCNCOM - Scan common
- 2) XCCOM - Transducer common
- 3) NTRCOM - Intre routine common
- 4) IBUF - Data buffer common
- 5) DSPCOM - Display common
- 6) ATPARA - Biomechan common
- 7) RCDCOM - Record common

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Bits 0-12 determine the offset in the selected common. This is always a word offset (even numbers only).

II. Absolute Mode

If bit 0 is set (number is odd), the word displayed is at the absolute address indicated by the switches minus one.

Module: DISPLA

Language: Macro-11

Called By: MNS

Calling Sequence: CALL DISPLA

External References: Commons

IBUF - incoming data common

Item	access	description
TDLY1	ro	MSD of trigger delay
TDLY2	ro	2nd digit of trigger delay
TDLY3	ro	LSD of trigger delay

DSPCOM - display common

Item	access	description
DTYPE	ro	Display type
MINX	r/w	Minimum of data range
MAXX	r/w	Maximum of data range
NDBX	wo	Number of digits behind decimal on X tic marks
NDBY	wo	Number of digits behind decimal on Y tic marks

NTRCOM - inter-module common

Item	access	description
NDATA	ro	Frequency data
ND	ro	NDATA scaling factor
STARTX	ro	Beginning of data in IBUF for display
STOPX	ro	End of data in IBUF for display
FSTART	ro	Beginning of frequency data for display
FSTOP	ro	End of frequency data for display
FWACT	ro	Frequency windowing active flag
IACT	r/w	Interpolation active flag
XACT	ro	Limited FFT display active
SSACT	ro	Same scan active
IREPT	ro	Number of points averaged

External References: Subroutines

name	description
ALPHA	Puts Tektronix in alpha mode
CHOUT	Outputs messages to the terminal
ERASE	Erases Tektronix screen
FPLOT	Plots functions out of memory
IPLOT	Plots individual points and lines
PRTH	Prints horizontally on terminal
PRTV	Prints vertically
SCNDSP	Display scan data on terminal

Functional Description:

DISPLA displays the signal data in several forms. Display options which may be selected provide capability to plot raw data, frequency data, or flaw data from a scan.

Module: DSETUP - data file set up routine

Language: Macro-11

Called By: CNTRL

Callins Sequence: CALL DSETUP

External References: Commons

TEKCOM - Tektronix common

Item	access	description
ICHBUF	ro	Input character buffer

RCDCOM - recording common

Item	access	description
RON	r/w	Recording on flag
FRPNTR	r/w	File block pointer
PSTAT	Ro	File status: 0 is new file, 1 is old
FSTAT1	ro	File status, 1 is insufficient space
WCHNUM	ro	Write channel number
CHNUM	wo	Active channel number

External References: Subroutines

name	description
ERASE	Erases Tektronix screen
HOME	Homes cursor on Tektronix terminal
CHOUT	Outputs characters to terminal
FNAMIN	Inputs filename and checks for existence
FOPEN	Opens active file via .ENTER
FCLOSE	Writes buffer to disk and closes file
CRLF	Sends carriage return/line feed

Functional Description:

DSETUP is called by CNTRL in response to a recording request (R). An option display is put up which allows the operator to select one of five options:

0-TURN RECORDING ON

Selection of this option causes RON to be set to 1 which will cause recording to the active file to begin when a scan is started.

1-TURN RECORDING OFF

Selection of this option clears RON and prevents any data recording.

2-CLOSE ACTIVE FILE AND TURN RECORDING OFF

Selection of this option clears RON and closes the active file after writing out any data remaining in the buffer.

3-OPEN NEW FILE

Selection of this option causes FNAMIN to be called. The selection of a new filename or use of a default name is allowed.

4-RETURN TO CONTROL DISPLAY

The program returns to CNTRL without taking any further action.

Module: DUMP - provides core dumps

Language: Macro-11

Called By: CNTRXC

Calling Sequence: CALL DUMP

External References: Commons

DUMP may access any word of any common in the system. Any address in memory may also be accessed.

External References: Subroutines

name	description
B2AO	Binary to ASCII octal conversion
ERASE	Erases Tektronix screen
HOME	Moves cursor on Tektronix
CHOUT	Outputs messages to Tektronix
CRLF	Sends carriage return/line feed to terminal

Functional Description:

DUMP prompts the user and waits for a particular common area or memory region to be selected. The specified region is dumped on the system console in octal words.

Module: FCLOSE - closes new files open for output

Language: Macro-11

Called By: CNTRL, DSETUP

Calling Sequence: CALL FCLOSE

External References: Commons

RCDCOM - recording common

Item	access	description
FBPNTR	r/w	File block pointer, 0=no file
WCHNUM	ro	Write channel number
OBPNTR	r/w	Index into OUTBUF
BHI1	ro	Buffer number 1 high address
BPNTR	ro	Pointer to buffer status words (0/2)

External References: Subroutines

name	description
WRTBUF	Write buffer out to disk

Functional Description:

FCLOSE closes files open on the channel designated in WCHNUM after writing out data buffers. An end of scan record is inserted before the buffer is written to disk.

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Module: FNAMEIN - file name input routine

Language: Macro-11

Called By:

Calling Sequence: CALL FNAMEIN

External References: Subroutines

TEKCOM - Tektronix common.

Item	access	description
ICHBUF	ro	Input character buffer

RCHCOM - recording common

Item	access	description
FBPNTN	ro	File block pointer
RBUF	r/w	RAD50 file block (input)
FBUF	r/w	ASCII filename (input)
DFLT	ro	Default file block
DFBUF	ro	ASCII default filename
FSTAT	ro	File status; 0 if new; 1 if old

External References: Subroutines

name	description
CHOUT	Writes characters to Tektronix
FFIND	Looks up file and returns status in FSTAT
CRLF	Sends carriage return/line feed

Functional Description:

FNAMEIN presents to the operator an option display consisting of two or three options:

0 - DEFAULT FILE TO 'SCRATCH.DAT'

Selection of this option sets FBPNTN to point to the default file block indicating that DK1:SCRATCH.DAT is the active file.

1 - ENTER FILENAME

Selection of this option causes the message 'ENTER FILENAME' to be output and the program then accepts a filename in the form NAME.EXT where standard length limitations apply. The file is looked up on the disk directory and, if it exists, FSTAT is set to 1.

2 - USE PREVIOUS FILENAME OF- ...

This option is displayed only if a file name has been previously entered in this run. The most recently input filename is displayed in the message. If this option is selected, FBPNTN is set to point to the file block associated with this file name. It is looked up on the disk and, if it exists, FSTAT is set to 1.

Module: FPLOTT - plots data on terminal  
Language: Macro-11  
Called BY: DISPLA  
Calling Sequence: CALL FPLOTT(DATA,N)  
where:

DATA is array of data  
N is number of array elements

External References: Commons

DSPCOM - display common

Item	access	description
MINX	ro	Minimum of data domain
MAXX	ro	Maximum of data domain
MINY	r/w	Minimum of data range
MAXY	r/w	Maximum of data range
Y0	ro	Data origin relative to Y axis in screen units
XLO	ro	X axis minimum in data units
XHI	ro	X axis maximum in data units

External References: Subroutines

name	description
PAXIS	Puts up axis for display of raw data
IPL0T	Plots points and lines on screen

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Functional Description:

FPLOTT plots the data in the given buffer with auto-ranging of display axes and data.

Module: FWINDO - frequency window input routine

Language: Macro-11

Called By: CNTRL

Calling Sequence: CALL FWINDOW

External References: Commons

NTRCOM - inter-module common

Item	access	description
MD	ro	MDATA scaling factor
RENT1	wo	1st option to be selected on reentry to CNTRL
FSTART	ro	Beginning of displayed data in MDATA
FSTOP	ro	End of displayed data
RENT2	wo	2nd option (suboption) to be selected
FWACT	ro	Frequency windowing active flag

CALCOM - Calculations common

Item	access	description
FWND	r/w	Frequency windows
FMD	r/w	Frequency windows' status

DSPCOM - display common

Item	access	description
MINX	ro	Minimum of data range
MAXX	ro	Maximum of data range
XO	ro	X coordinate of data origin in screen units
YO	ro	Y coordinate of data origin in screen units
XLO	ro	X axis minimum in data units
XHI	ro	X axis maximum in data units
YLO	ro	Y axis minimum in data units
YHI	ro	Y axis maximum in data units

External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal
GRIN	Inputs graphic data from the Joystick
HOME	Home cursor on terminal
IPL0T	Plots points and lines on terminal

Functional Description:

FWINDO provides the capability to place and remove windows in the frequency data. The operator gives two opposite corners of the window to define it.

Module: IENCDE - binary to ASCII decimal conversion

Language: Macro-11

Called By:

Calling Sequence: CALL IENCDE(N,KBUF)

where:

N is input value

KBUF is 6 byte ASCII output buffer

Functional Description:

IENCDE converts one 16 bit binary value to its decimal ASCII equivalent. Input value is assumed to be 2's complement notation.

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Module: LSIINT - LSI-11 interrupt service

Language: Macro-11

Vector Set By: BEGIN1

External References:

SCNCOM - scan common

Item	access	description
NCDR	wo	Encoder readings
NCDRCV	r/w	Encoder readings recieved flag
SCNFIN	r/w	Scan finished flag
LSIDAT	r/w	Data from LSI-11
ERROR	r/w	Error flag/count from LSI-11
ARIVED	r/w	Completion flag for move command
COMIP	r/w	Communications in progress flag

DBGCOM - debug common

Item	access	description
TFCNT	r/w	To fast count (missed point)
SPCNT	r/w	Scan pass count

External References: I/O Registers

address	access	description
167740	r/w	CSR for DR11-C to LSI-11
167744	ro	Read register for DR11-C from LSI-11

Functional Description:

LSIINT services interrupts from the LSI-11, setting encoder readings and setting various flags.

Module: MNS - primary ultrasonics driver  
Language: Macro-11

External References: Commons

SCNCOM - scan common

Item	access	description
STATUS	ro	Status of scan

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

NTRCOM - inter module common

Item	access	description
IEXIT	r/w	Exit request flag
RENTR	r/w	1st option to be selected on reentry to CNTRL
REPKN	ro	Repeat count for averaging

External References: Subroutines

name	description
AVGR	Signal averaging routine
BEGIN	Initialization routine
BSETUP	Biomation setup routine
CALC	Calculations routine
CNTRL	System control module
CONDSP	Console display routine
DISPLA	Data display routine
PACK	Pack word data into bytes
RDT	Raw data thresholding
RECORD	Signal compression and recording
SCAN	Real-time data acquisition
SCAND	Recorded data expansion
SEARCH	Processes time windows
TEKIN	Enable terminal interrupt
UNPACK	Unpacks byte data into words
WSH	Writes scan header

Functional Description:

MNS drives all of the subroutines in the primary ultrasonics task.

Module: PAXIS - plots axes  
Language: Macro-11  
Called By: FPLOT  
Calling Sequence: CALL PAXIS  
External References: Commons

DSPCOM - display common

Item	access	description
MINX	ro	Minimum of data domain
MAXX	ro	Maximum of data domain
MINY	ro	Minimum of data range
MAXY	ro	Maximum of data range
XO	ro	X coordinate of data origin in screen units
YO	ro	Y coordinate of data origin in screen units
XLO	ro	X axis minimum in data units
XHI	ro	X axis maximum in data units
YLO	ro	Y axis minimum in data units
YHI	ro	Y axis maximum in data units
DX	ro	X axis tic spacing in data units
DY	ro	Y axis tic spacing in data units
XLNC	ro	X axis tic spacing in screen units
XTLBL	ro	6 character ASCII tic labels for X
YLNC	ro	Y axis tic spacing in screen units
YTLBL	ro	6 character ASCII tic labels for Y
NDBX	ro	Number of digits behind decimal on X tic labels
NDBY	ro	Number of digits behind decimal on Y tic labels

External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal
ERASE	Erases the Tektronix screen
IPLOT	Plots points and lines on terminal
PSCALE	Calculates scale factors

Functional Description:

PAXIS plots axes and labeled tic marks on the Tektronix terminal.

Module: PLTW - window plotting routine

Language: Macro-11

Called By: TWINDO

Calling Sequence: CALL PLTW

External References: Commons

DSPCOM - display common

Item	access	description
MINX	ro	Minimum of data domain
MAXX	ro	Maximum of data domain
XO	ro	X coordinate of data origin in screen units
YO	ro	Y coordinate of data origin in screen units
XLO	ro	X axis minimum in data units
XHI	ro	X axis maximum in data units
YLO	ro	Y axis minimum in data units
YHI	ro	Y axis maximum in data units
XWL	r/w	Low X limit of active window in data units
YWL	r/w	Low Y limit of active window in data units
XWH	r/w	High X limit of active window
YWH	r/w	High Y limit of active window
WTP	ro	Type of active window

NTRCOM - inter routine common

Item	access	description
STARTX	ro	Low limit of data to be displayed
STOPX	ro	High limit

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External References: Subroutines

name	description
CHOUT	Writes characters to Tektronix terminal
HOME	Homes cursor on terminal
IPLOT	Plots vectors on Tektronix terminal

Functional Description:

PLTW converts the coordinates passed to it (through common) into screen units and plots a rectangular window on the Tektronix terminal. This window is then marked on the upper right hand corner with a single character. If the window will not fit entirely in the display it is altered so that any boundary which would be outside of the display appears on the boundary of the display.

Module: PSCALE - plot scaling calculations

Language: Macro-11

Called By: PAXIS

Calling Sequence: CALL PSCALE(MIN,MAX,LO,HI,D,TLBL,LNC,O,AL,D2)

where:

MIN,MAX	=	Data range (input)
HI,LO	=	Axis range (input)
D	=	Tic spacing in data units (input)
TLBL	=	Array of 6 byte ASCII tic labels (output)
LNC,O	=	Tic increment,origin (output)
AL	=	Axis length (output)
D2	=	Digits behind decimal (output)

External References: Subroutines

name	description
IENCODE	Converts binary numbers to 6 byte ASCII decimal

Functional Description:

PSCALE produces tic labels and scaling parameters for the display axes.

Module: RDT - raw data thresholding

Language: Macro-11

Called By: MNS

Callins Sequence: CALL RDT

External References: Commons

DSPCOM - display common

Item	access	description
TWND	ro	Time windows
TWNDT	ro	Time window types

IBUF - incoming data buffer

Item	access	description
IBUF	r/w	Raw data buffer

Functional Description:

If no thresholding window has been placed, RDT returns without taking any action. If the T window has been placed, RDT scans the data between the time axis limits of the window and changes data points which are below the high Y axis limit of the window to be equal to it. This simulates the thresholding capability of conventional ultrasonics systems.

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Module: RECORD - compression and recording routine

Language: Macro-11

Called By: MNS

Calling Sequence: CALL RECORD

External References: Commons

DSPCOM - display common

Item	access	description
TWOFFS	ro	Time window offset

RCDCOM - recording common

Item	access	description
RON	r/w	Recording on flag
BLKNUM	ro	Block number
BLKCNT	ro	Block count
THXCD	ro	Threshold exceeded flag
OBPNTR	r/w	OUTBUF pointer
BUFEND	ro	End of current compressed data buffer
RSTART	ro	1st byte to be recorded in IBUF
RSTOP	ro	Last byte to be recorded in IBUF

SCNCOM - scan common

Item	access	description
STATUS	ro	Status of scan

IBUF - incoming data common

Item	access	description
IBUF	r/w	Raw data buffer

External References: Subroutines

name	description
FCL9SE	Closes compressed data file
WPH	Writes point headers
WRTBUF	Writes OUTBUF contents to disk

#### Functional Description:

If recording is 'on' and SEARCH has detected a flaw, RECORD compressed the data in the recording window, or all the displayed data if no recording window has been placed, into the active buffer in OUTBUF. If the buffer becomes full it is written to disk and the process continues with the alternate buffer.

The compression scheme used in RECORD allows considerable reduction of smooth continuous data involving a small number of discrete values. Since the data from the Biomation is only 8 bits in length and is a result of the recording of a continuous signal, this method is effective.

This routine compresses the data to an initial point and a series of commands. These commands operate like relative plotter command - proscribing the pen's motion in a plane. The one byte command is divided into two fields: the command field and the count.

```
-----  
1 1 1 1 1 1 1 1  
cmd. | count
```

The command may be a value zero through seven and the count is in the range zero through 31. If a count greater than 31 is needed, the command is inserted with a zero count and the actual count is placed in the

following byte. The presently implemented commands are described in figure A-2.

Figure A-2

Data Compression Commands

cmd. mask description

0	0	End of record mark
1	40	Advance straight ahead - count gives number of data values
2	100	Go up one and advance - count gives number of values
3	140	Go down one and advance - count gives number of values
4	200	Go up - count gives change in value (advance of 1 implied)
5	240	Go down - count gives change in value (advance of 1 implied)

Commands 6 and 7 are reserved.

For all commands, if a count greater than 37(8) (5 bits) is required, a zero count is inserted and the next byte contains the actual count.

Module: RKM0D - file manipulation routines

Language: Macro-11

Entry Point: FFIND - file lookup routine

Called By: FNAMIN

Calling Sequence: CALL FFIND

External References: Commons

RCDCOM - recording common

Item	access	description
FBPNTR	ro	File block pointer
FSTAT	r/w	File status, 0 if new, 1 if old
CHNUM	ro	Active channel number

Functional Description:

FFIND looks up the file pointed to by FBPNTR. If it exists, FSTAT is set to 1, if not it is cleared. If it exists it is opened on the channel indicated by CHNUM.

Entry Point: FOPEN - file opening routine

Called By: DSETUP

Calling Sequence: CALL DSETUP

External References: Commons

RCDCOM - recording common

Item	access	description
FBPNTR	ro	File block pointer
FSTAT1	r/w	File status, 1 if not enough space
CHNUM	ro	Active channel number
BLKCNT	ro	Block count

Functional Description:

FOPEN attempts to open the file indicated by the file block pointed to by FBPNTR. The largest available space on disk is allocated. If no space available, FSTAT1 is set to 1 and the program returns. If other I/O error occurs, a message is written to the console and the program exits.

Module: S0 - source zero input routine

Language: Macro-11

Called By: CNTRL

Calling Sequence: CALL S0

External References: Commons

CALCOM - calculations common

Item	access	description
KOSINE	ro	Table of cosine values

IBUF - incoming data common

Item	access	description
IBUF	wo	Raw data buffer

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

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External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal
ERASE	Erases the Tektronix screen
GRIN	Graphic input routine

Functional Description:

S0 generates simulated data as directed by the operator. The operator is prompted and input is accepted. S0 is called when simulated data is selected.

Module: S1 - real-time data input routine

Language: Macro-11

Called By: CNTRL

Callins Sequence: CALL S1

External References: Commons

SCNCOM - scan common

Item	access	description
SRCHTP	wo	Search type
TX1	r/w	Total scan low X limit
TY1	r/w	Total scan low Y limit
TZ1	r/w	Total scan low Z limit
TX2	r/w	Total scan high X limit
TY2	r/w	Total scan high Y limit
TZ2	r/w	Total scan high Z limit
TBUF	wo	Total scan bit map
STATUS	wo	Status of scan
NCDR	ro	Encoder readings
COMAND	wo	Command to LSI-11
NCDRCV	r/w	Encoder readings recieved flag

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

External References: Subroutines

name	description
BELL	Rings bell on terminal
CHOUT	Outputs messages to terminal
ERASE	Erases Tektronix screen
HOME	Homes cursor on terminal
WRTLSI	Sends command packets to LSI-11

Functional Description:

S1 is called when data source 1 is selected by the operator. The user is prompted to determine the scan mode. If 'no scan' is selected, common variables are set up and control returns to the callins module. If 'scan' is selected, an 'encode on reset' command is sent to the LSI-11. When the reset button on the remote control unit is pressed and released, the coordinates of the scanner are sent to the 11/45 and become a corner of the scan. This process is repeated to get the opposite corner.

Module: S2 - source 2 (disk) setup routine

Language: Macro-11

Called By: CNTRL

Calling Sequence: CALL S2

External References: Commons

RCDCOM - recording common

Item	access	description
RON	ro	Recording on flag
FSTAT	ro	File status, 1=existing file
RCHNUM	ro	Read channel number
CHNUM	r/w	Active channel number

External References: Subroutines

name	description
ERASE	Erases Tektronix screen
HOME	Moves cursor on Tektronix
CHOUT	Outputs characters to Tektronix
FNAMIN	Inputs file name and checks for existence

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Functional Description:

If recording is on, S2 returns immediately. If a read file is open it is closed and the operator is queried as to whether he wishes to open another file. If no read file is open FNAMIN is called to accept input of a file name. If the input file does not exist, a message is written to that effect and FNAMIN is called again. If the file exists it is opened on the channel designated by RCHNUM.

Module: SCAN - send scan commands to LSI-11

Language: Macro-11

Entry Points: SCAN, WRTLSI

Called By: MNS

Calling Sequence: CALL SCAN

External References: Commons

SCNCOM - scan common

SOURCE	ro	Source of data
DRCHTP	ro	Search type
TX1	ro	Low X coordinate of total scan
TY1	ro	Low Y coordinate of total scan
TX2	ro	High X coordinate of total scan
TY2	ro	High Y coordinate of total scan
SX1	ro	Low X coordinate of sub scan
SY1	ro	Low Y coordinate of sub scan
SX2	ro	High X coordinate of subscan
SZ2	ro	High Y coordinate of subscan
STATUS	ro	Status of scan
XPNT	ro	X coordinate for point scan
YPNT	ro	Y coordinate for point scan
XLIM1	r/w	Low X limit of scan
YLIM1	r/w	Low Y limit of scan
XLIM2	r/w	High X limit of scan
YLIM2	r/w	High Y limit of scan
COMAND	r/w	Command to LSI-11
CMDAT	r/w	Command data for LSI-11
NCDRCV	r/w	Encoder readings recieved flag
SCNFIN	ro	Scan finished flag
AXIS	ro	Scan axis
NUMPNT	ro	Number of points on X axis
DXMIN	ro	Minimum increment for scan
ARIVED	r/w	Move command completion flag
COMIP	r/w	Communications in progress flag
OFFSF	ro	Offset scan flag

DBGCOM - debug common

Item	access	description
TFCNT	wo	Missed point count

External References: I/O Registers

address	access	description
167740	r/w	CSR for DR11-C to LSI-11
167742	wo	Write register for DR11-C to LSI-11

External References: Subroutines

name	description
ARM	Arms Biomation recorder
B8100	Gets data from Biomation
CONDSP	Console display routine
WSH	Writes scan header

Functional Description:

SCAN initiates scans and sends commands to the LSI-11.

Module: SCAND - scan disk

Language: Macro-11

Called By: MNS

Calling Sequence: CALL SCAND

External References: Commons

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

RCDCOM - recording common

Item	access	description
FBPNT	r/w	File block pointer
RCHNUM	ro	Read channel number
BLKNUM	r/w	Block number
OBPNT	r/w	OUTBUF pointer
XDCRID	wo	Transducer identification
SMPLID	wo	Sample identification
RSTART	r/w	Offset of 1st recorded value
RSTOP	wo	Offset of last recorded value
OUTBUF	r/w	Compressed data buffer

IBUF - incoming data common

Item	access	description
IUTS	r/w	Sample duration units
IRNG	r/w	Sample duration range
IBUF	wo	Raw data buffer

ATPARA - Biomation common

Item	access	description
TDLY1	r/w	MSD of trigger delay magnitude
TDLY2	r/w	2nd digit of trigger delay
TDLY3	r/w	LSD of trigger delay magnitude

SCNCOM - scan common

Item	access	description
SOURCE	r/w	Source of data
STATUS	wo	Status of scan
XPNT	wo	X coordinate of point in scan
YPNT	wo	Y coordinate of point in scan
ZPNT	wo	Z coordinate of scan
XLIM1	wo	Low X limit of scan
YLIM1	wo	Low Y limit of scan
XLIM2	wo	High X limit of scan
YLIM2	wo	High Y limit of scan
DXMIN	wo	Scan increment
QFSF	wo	Offset scan flag

NTRCOM - inter module common

Item	access	description
STARTX	ro	Beginning of data to be displayed
STOPX	ro	End of data to be displayed

DSPCOM - display common

Item	access	description
TWOFFS	wo	Time window offset

External References: Files/LUNS

LUN	actions	description
RCHNUM	R	Compressed signal data file

External References: Subroutines

name	description
CHOUT	Outputs messages to the Tektronix terminal
CONDSP	Console display routine
ERASE	Erase the storage screen on the terminal
HOME	Homes the alpha cursor to the upper left

Functional Description:

If data source two has not been selected, control returns to the calling program immediately. If source two has been selected, a file will have been opened by S2. SCAND will read the data file and expand the next point of compressed data into IBUF in byte packed form. The values found in point headers and scan headers will be transferred to the appropriate common locations. If an end of scan condition is detected, a message is output to the terminal. If an end of file occurs, an undefined data source is selected, the operator is notified of the end of file and the file is closed.

Module: SCNDSP - scan display

Language: Macro-11

Called By: DISPLA

Calling Sequence: CALL SCNDSP

External References: Commons

DSPCOM - display common

Item	access	description
DTYPE	ro	Display type
SBUF	ro	Sub-scan buffer
TBUF	ro	Total scan buffer

External References: Subroutines

name	description
CHOUT	Outputs characters to terminal
ERASE	Erases the Tektronix screen
HOME	Home cursor on terminal
IPL0T	Plots points and lines on graphics terminal

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Functional Description:

SCNDSP produces flaw plots from either a total or sub scan. The flaws have been logged in TBUF or SBUF by SEARCH. Resolution of the display is 64x64 points.

Module: SEARCH

Language: Macro-11

Entry Point: SEARCH

Called By: MNS

Calling Sequence: CALL SEARCH

External References: Commons

DSPCOM - display common

Item	access	description
TWND	ro	Time windows
TWNDT	ro	Time window types
TWOFFS	r/w	Time window offset

IBUF - incoming data common

Item	access	description
IBUF	ro	Raw data buffer

SCNCOM - scan common

Item	access	description
SRCHTP	ro	Search type
SRUF	wo	Sub scan flaw log buffer
TBUF	wo	Total scan flaw log buffer
STATUS	ro	Status of scan
NCDT	ro	Encoder readings
XLIM1	ro	Low X limit of scan
YLIM1	ro	Low Y limit of scan
XLIM2	ro	High X limit of scan
YLIM2	or	High Y limit of scan

RCDCOM - recording common

Item	access	description
THXCD	r/w	Threshold exceeded flag

#### Functional Description:

SEARCH processes the time windows (except R and T window). If an alarm condition is detected in any of the existing alarm windows, THXCD is set. The front surface window (F) is processed, if placed, to correct for non-level specimen in the test tank.

Module: TC - trigger control

Language: Macro-11

Called By: CNTRL

Calling Sequence: CALL CNTRL

External References: Commons

ATPARA - Biomation common

Item	access	description
TLEVS	wo	Trigger level polarity
TLEV1	wo	MSD of trigger level magnitude
TLEV2	wo	LSD of trigger level magnitude
TSRC	wo	Trigger source
TSLOP	wo	Trigger slope
TCOUP	wo	Trigger coupling

TEKCOM -Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer from Tektronix

External References: Subroutines

name	description
CHOUT	Outputs messages to terminal
ERASE	Erases screen on graphic terminal
HOME	Homes cursor on terminal

Functional Description:

TC solicits input from the operator to set up the trigger parameters for the Biomation waveform recorder.

Module: TEKMOD - Tektronix module

Language: Macro-11

Entry Point: ALPHA - puts terminal in alpha mode

Calling Sequence: CALL ALPHA

Entry Point: ALPHA2 - puts terminal in large character mode

Calling Sequence: CALL ALPHA2

Entry Point: BELL - rings bell on Tektronix terminal

Calling Sequence: CALL BELL

Entry Point: CHOUT - outputs character strings to the terminal

Calling Sequence: CALL CHOUT(MBUF)

where: MBUF is an array, the first element of which is a word containing the character count.

Entry Point: CR - sends a carriage return to the terminal

Calling Sequence: CALL CR

Entry Point: CRLF - sends a carriage return/line feed to the terminal

Calling Sequence: CALL CRLF

Entry Point: ERASE - erases screen on Tektronix terminal

Calling Sequence: CALL ERASE

Entry Point: GRIN - graphic input routine

Calling Sequence: CALL GRIN(IALPHA,IX,IY)

where: IALPHA is key pressed to enter coordinate  
IX is X coordinate of graphic crosshair  
IY is Y coordinate of graphic crosshair

Entry Point: HOME - homes cursor to upper left

Calling Sequence: CALL HOME

Entry Point: IPLOT - positions graphic cursor

Calling Sequence: CALL IPLOT(IX,IY,IPEN)

Where: IX is X coordinate to which cursor is to be moved  
IY is Y coordinate to which cursor is to be moved  
IPEN is pen control 0/1 for Up/Down

Entry Point: LF - sends line feed character to terminal

Calling Sequence: CALL LF

Entry Point: LFCR - sends line feed/carriage return to terminal

Calling Sequence: CALL LFCR

Entry Point: PRTH - prints horizontally on terminal

Calling Sequence: CALL PRTH

Entry Point: PRTV - prints vertically on terminal

Calling Sequence: CALL PRTV

Entry Point: TEKIN - enable interrupts from Tektronix terminal

Calling Sequence: CALL TEKIN

After TEKIN has been called, unsolicited characters input on the

terminal are placed in ICHBUF of the common TEKCOM.

Exceptions are:

ESCAPE (ASCII 33) - aborts current operation and returns system  
to primary option display.  
CNTRL Q (ASCII 21) - sends 'stop scanner' command to LSI-11  
CNTRL R (ASCII 22) - sends 'reset' to LSI-11 to reset scanner  
system.

External References: I/O Registers

address	access	description
175610	r/w	CSR for terminal interface
175612	ro	Read register for terminal interface
175614	r/w	
175616	wo	Write register for terminal interface
370	wo	Terminal interrupt vector

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Module: TWINDO - time window placement and deletion routine

Language: Macro-11

Called By: CNTRL

Calling Sequence: CALL TWINDO

External References: Commons

DSPCOM - display common

Item	access	description
TWNO	wo	Time windows
TWNOI	r/w	Time window types
PNT	ro	Coordinates of last input in window units
XWL	r/w	Coordinates of window sent from WINT or to be sent to PLTW
YWL	r/w	
XWH	r/w	
YWH	r/w	
WCHAR	ro	Character entered with first data point
TWOFFS	r/w	Time window offset

NTRCOM - inter routine common

Item	access	description
RENT	wo	Selects option upon reentry to CNTRL
STARTX	r/w	Low limit of data to be displayed
STOPX	r/w	High limit
RENT2	wo	Selects secondary option upon reentry to CNTRL

RDCOM - recording common

Item	access	description
RSTART	wo	Start location for recording
RSTOP	wo	Last location to be recorded

TEKMOD - Tektronix common

Item	access	description
ICHBUF	r/w	Input character from terminal

External References: Subroutines

name	description
CHOUT	Writes characters to Tektronix terminal
HOME	Homes cursor on terminal
PLTW	Plots the time windows on the display
WINT	Inputs time window coordinates

Functional Description:

TWINDO causes DISPLAY to display the raw data on the graphic terminal. The operator is then prompted to input points using the Joystick and keyboard. A pair of points are entered to define a window in the data. The key used to enter the first of these points is used to identify the window. If the key entered is a valid window type, the window entered is added to the list. If an invalid window is entered, the program returns to CNTRL. If the 'DELETE' key is pressed, and the crosshairs are within a window, that window will be flashed. If the 'DELETE' key is then pressed again, that window will be deleted. If any other key is pressed, the deletion is rejected. If the crosshair was within more than one window, after deletion of the first window is rejected, another window in which the crosshairs appeared will be flashed.

This window may also be rejected. Thus any of a set of nested windows may be deleted. After a window has been deleted, a fresh display will be generated. If a new front surface window, recording window, or threshold window is placed, the old one is implicitly deleted. The display will not be refreshed and both the old and new window will be displayed until the display is refreshed for some other reason. If five alarm windows have been placed, attempts to place a sixth window will be ignored. The valid windows are:

Type	ID	Description
0	N/A	Inactive window
1	@	Any-Out alarm window
2	-	No-Out alarm window
3	R	Recording window
4	T	Raw data threshold window
5	F	Front surface window
6	P	Peak-In alarm window

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Module: UNPACK - unpacks/packs IBUF

Language: Macro-11

Entry Point: PACK - packs IBUF into bytes

Called By: MNS

Calling Sequence: CALL PACK

Functional Description:

PACK packs word length data in IBUF into byte length data in the first half of IBUF. It is assumed that each value is in the range from -128 to 127.

Entry Point: UNPACK - unpacks IBUF into words

Called By: MNS

Calling Sequence: CALL UNPACK

Functional Description:

UNPACK unpacks the data in the first half of IBUF from byte length to word length. This operation yields an array which completely fills IBUF.

External References: Commons

IBUF - incoming data common

Item	access	description
------	--------	-------------

IBUF	r/w	Raw signal data from Biomation 8100
------	-----	-------------------------------------

Module: VIEW - sets up sub-scans and point scans

Language: Macro-11

Called By: CNTRL

Calling Sequence: CALL VIEW

External References: Commons

SCNCOM - scan common

Item	access	description
SRCHTP	wo	Search type
TX1	ro	Low X coordinate of total scan
TY1	ro	Low Y coordinate of total scan
TX2	ro	High X coordinate of total scan
TY2	ro	High Y coordinate of total scan
SX1	r/w	Low X coordinate of sub-scan
SY1	r/w	Low Y coordinate of sub-scan
SX2	r/w	High X coordinate of sub-scan
SY2	r/w	High Y coordinate of sub-scan
SBUF	wo	Sub-scan bit map buffer
STATUS	r/w	Status of scan
XPNT	wo	X coordinate for point scan
YPNT	wo	Y coordinate for point scan
XLIM1	r/w	Low X limit of active scan
YLIM1	r/w	Low Y limit of active scan
XLIM2	r/w	High X limit of active scan
YLIM2	r/w	High Y limit of active scan

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NTRCOM - inter module common

Item	access	description
RENT	wo	1st option to be selected on reentry to CNTRL
RENT2	r/w	Option to be selected on reentry to VIEW

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

DSPCOM - display common

Item	access	description
DTYPE	wo	Display type

External References: Subroutines

name	description
CHOUT	Outputs character to terminal
ERASE	Erases screen on terminal
GRIN	Graphic input routine
HOME	Homes cursor to upper left

Functional Description:

If no scan has been performed, VIEW issues a message to that effect and returns. If a total scan has been performed but no sub-scan, the operator is presented with the flaw map from the scan and is asked to input the limits of the sub-scan using the Joystick. After the limits have been entered, control returns to the primary option display and, when 'G' is pressed, the sub-scan begins.

If a sub-scan has previously been performed, the user is asked to select either a new sub-scan or a new point scan. If sub-scan is selected, entry of scan limits proceeds as indicated above. If point scan

is selected, the operator is presented with the flaw map of the sub-scan and is asked to enter the desired point using the joystick. When the point has been entered, control returns to the primary option display. When 'G' is pressed, the scanner moves to the indicate point, and raw data collected from that point is displayed.

Module: WINT - window input routine  
Language: Macro-11  
Called By: TWINDO  
Calling Sequence: CALL WINT(STATUS)  
where STATUS is returned as:  
0 - Valid window entered  
2 - Delete was pressed  
4 - Return was pressed

External References: Commons

DSPCOM - display common

Item	access	description
MINX	ro	Minimum of data domain
MAXX	ro	Maximum of data domain
MINY	ro	Minimum of data range
MAXY	ro	Maximum of data range
XO	ro	Data origin relative to X axis in screen units
YO	ro	Data origin relative to Y axis
XLO	ro	X axis minimum in data units
XHI	ro	X axis maximum in data units
YLO	ro	Y axis minimum in data units
YHI	ro	Y axis maximum in data units
PNT	r/w	Coordinates of input point - screen units
XWL	r/w	Low X coordinate of input point - screen units
YWL	r/w	Low Y coordinate of input point
XWH	r/w	High X coordinate
YWH	r/w	High Y coordinate
WCHAR	w	Character input with first point

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NTRCOM - inter routine common

Item	access	description
STARTX	ro	Low limit of data to be displayed
STOPX	ro	High limit

External References: Subroutines

name	description
CHOUT	Writes characters to Tektronix terminal
GRIN	Inputs graphic information from Joystick

Functional Description:

WINT puts up the crosshairs on the display and allows the operator to input two points. If the first point is entered with the 'DELETE' key, WINT returns to the calling program with the status set to 2. If either point entered is a carriage return, WINT returns to the calling program with the status set to 4. If the second data point is entered with the 'DELETE' key, the first point is discarded and the program assumes the same state as before the first point was entered. WINT converts the input screen points into data units and places them and the first character entered in common then returns.

Module: WPH - writes point header

Language: Macro-11

Called By: RECORD

Calling Sequence: CALL WPH

External References: Commons

RCDCOM - recording common

Item	access	description
OBPNTR	r/w	Index into OUTPBUF
BUFEND	ro	High address of active buffer
RSTART	ro	First word in IBUF to be recorded
RSTOP	ro	Last word in IBUF to be recorded
OUTBUF	wo	Compressed data buffer

IBUF - incoming data common

Item	access	description
IBUF	ro	Raw data buffer

SCNCOM - scan common

Item	access	description
NCDR	ro	Encoder readings

DSPCOM - display common

Item	access	description
TWOFFS	ro	Time window offset

External References: Subroutines

name	description
WRTBUF	Writes OUTBUF to disk

Functional Description:

WPH writes the appropriate values to constitute a point header into the active buffer. If the buffer is filled, WRTBUF is called.

Module: WRTBUF - writes OUTBUF to disk  
Language: Macro-11  
Called By: RECORD, WPH, WSH  
Calling Sequence: CALL WRTBUF(ARG)  
where: ARG is number of blocks to be written - if zero, complete buffer  
is written.

External References: Commons

RCDCOM - recording common

Item	access	description
RON	r/w	Recording on flag
FBPNTR	ro	File block pointer
WCHNUM	ro	Write channel number
BLKNUM	r/w	Current block number in file
OBPNTR	r/w	Buffer 1 busy flag
READY2	r/w	Buffer 2 busy flag
BHI1	ro	Buffer 1 high address
BHI2	ro	Buffer 2 high address
BLOW1	ro	Buffer 1 low address
BLOW2	ro	Buffer 2 low address
BPNTN	r/w	Active buffer pointer
BUFEND	r/w	Active buffer high address
CRPNTR	r/w	Completion routine pointer
OUTBUF	ro	Compressed data buffer

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Functional Description:

WRTBUF maintains two 1024. byte buffer within OUTBUF. Any routine which writes values into these buffers must use OBPNTR as an index into the buffer and must not insert values past the address given in BUFEND. OBPNTR must be updated before exiting any routine which puts data in OUTBUF. When the buffer is full (OBPNTR = BUFEND), WRTBUF is called.

The active buffer is written out to the channel indicated by WCHNUM which is normally a file on DK1. OBPNTR and BUFEND are then set up to allow the other buffer to be filled. BLKNUM (the block number) is incremented and the routine returns. Upon completion of the I/C operation a completion routine is called by the operating system. This completion routine clears the appropriate buffer busy flag, swaps the completion routine pointer and returns. If an end of file condition occurs, the file is closed, recording is turned off and a message is put out to the terminal.

Module: WSH - writes scan headers

Language: Macro-11

Called By: MNS

Calling Sequence: CALL WSH

External References: Commons

SCNCOM - scan common

Item	access	description
TZ1	ro	Z coordinate of total scan
STATUS	ro	Status of scan
XLIM1	ro	Low X limit of active scan
YLIM1	ro	Low Y limit of active scan
XLIM2	ro	High X limit of active scan
YLIM2	ro	High Y limit of active scan
DXMIN	ro	Scan increment
OSFS	ro	Offset scan flag

IBUF - incoming data common

Item	access	description
IUTS	ro	Sample duration units
IRNG	ro	Sample duration range

ATPARA - Biomation common

Item	access	description
TDLY1	ro	MSD of trigger delay magnitude
TDLY2	ro	2nd digit of trigger delay magnitude
TDLY3	ro	LSD of trigger delay magnitude

RCDCOM - recording common

Item	access	description
RON	ro	Recording on flag
OBPNTR	r/w	OUTBUF pointer
XDCRID	ro	Transducer identification
SMPLID	ro	Sample identification
BUFEND	ro	End address of active buffer
OUTBUF	wo	Compressed data buffer

External References: Subroutines

Item	access	description
WRTBUF		Writes active section of OUTBUF to disk

Functional Description:

If recording is not on or a new scan is not active, WSH returns without taking any action. If recording is on and a new scan is active, WSH writes a scan header into OUTBUF starting at the location given in OBPNTR. If the active buffer becomes full, it is written to disk. The header format is given in figure A-3a.

Module: XAMIN - selects portion of frequency data for display

Language: Macro-11

Called By: CNTRL

Calling Sequence: CALL XAMIN

External References: Commons

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DSPCOM - display common

Item	access	description
MINX	ro	Minimum of data domain
MAXX	ro	Maximum of data domain
XO	ro	X axis data origin offset in screen units
XLO	ro	X axis minimum in data units
XHI	ro	X axis maximum in data units

NTRCOM - inter module common

Item	access	description
RENTN	wo	Option to be selected on reentry to CNTRL
FSTART	r/w	Low limit of frequency data for display
FSTOP	r/w	High limit of frequency data for display
XACT	wo	XAMIN active flag

External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal
GRIN	Graphic input routine
HOME	Homes cursor on terminal

Functional Description:

XAMIN allows the user to zoom in and out on the frequency data to see details.

Module: ZOOM - selects portion of raw data for display

Language: Macro-11

Called By: CNTRL

Calling Sequence: CALL ZOOM

External References: Commons

DSPCOM - display common

Item	access	description
MINX	ro	Minimum of data domain
MAXX	ro	Maximum of data domain
XO	ro	X axis data origin offset in screen units
XLO	ro	X axis minimum in data units
XHI	ro	X axis maximum in data units

ATPARA - Biomation common

Item	access	description
TDLY1	r/w	MSD of trigger delay magnitude
TDLY2	r/w	2nd digit of trigger delay magnitude
TDLY3	r/w	LSD of trigger delay magnitude

NTRCOM - inter module commons

Item	access	description
RENTX	wo	Option to be selected on reentry to CNTRL
STARTX	r/w	Beginning of raw data to be displayed
STOPX	r/w	End of raw data to be displayed
IACT	r/w	Interpolation active flag

IBUF - incoming data common

Item	access	description
IUTS	r/w	Sample duration units
IRNG	r/w	Sample duration range

Functional Description:

ZOOM allows the operator to zoom in and out on a selected area of the raw data. The Joystick is used to enter points.

Appendix B

Description of Common Areas in PUT

Nine named common areas are included in the Primary Ultrasonics Task.

name	size	use
ATPARA	48.	Biomation control parameters
IBUF	2062.	Incoming data common
TEKCOM	2.	Tektronix terminal input
DSPCOM	136.	Display parameters
DBGCOM	2.	Debug data
NTRCOM	2066.	General task parameters
SCNCOM	573.	Scan parameters
RCDCOM	1086.	Recording parameters
CALCOM	554.	Calculation control and data

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These common areas are described on the following pages.

Common: ATPARA - Biomation control parameters  
Accessed By: 981, BEGIN, BSETUP, CONDSP, DISPLA, DUMP, SCAND, TC, WSH,  
ZOOM in PUT  
also: BEGXC, CONDSP, DISPXC, DUMPXC, IRXC, RECXC, XCAXIS, ZOOMXC in XC

byte name	description
0 ADLY1	MSD of arm delay magnitude
2 TDLY1	MSD of trigger delay magnitude
4 ADLY2	2nd digit of arm delay magnitude
6 TDLY2	2nd digit of trigger delay magnitude
8 ADLY3	LSD of arm delay magnitude
10 TDLY3	LSD of trigger delay magnitude
12 ALEVS	Arm level polarity
14 TLEVS	Trigger level polarity
16 ALEV1	MSD of arm level magnitude
18 TLEV1	MSD of trigger level magnitude
20 ALEV2	LSD of arm level magnitude
22 TLEV2	LSD of trigger level magnitude
24 AMODE	Arm mode (Input/Auto)
26 TMODE	Trigger mode (Input/Auto)
28 ASRC	Arm source (Ext./Int.)
30 TSRC	Trigger source (Ext./Int.)
32 AISRC	Arm internal source (channel A/B)
34 TISRC	Trigger internal source
36 ASLOP	Arm slope (Neg/Pos.)
38 TSLOP	Trigger slope
40 ACOUP	Arm coupling (DC/AC)
42 TCOUP	Trigger coupling
44 ACNT	Arm control (Manual/Digital)
46 TCNT	Trigger control
48 ASEL	Channel A selected (No/Yes)
50 BSEL	Channel B selected
52 ACCNT	Channel A control (Manual/Digital)
54 BCCNT	Channel B control
56 AAPC	Channel A positive coupling (Off/AC/DC)
58 ABPC	Channel B positive coupling
60 AAMC	Channel A negative coupling
62 ABMC	Channel B negative coupling
64 ARNG	Channel A input range
66 BRNG	Channel B input range
68 AOFFS	Channel A input offset
70 BOFFS	Channel B input offset
72 ACHM	Channel A mode (Off/Input)
74 BCHM	Channel B mode
76 APOL	Channel A polarity (Neg/Pos)
78 BPOL	Channel B polarity

Note: See Biomation Model 8100 Waveform Recorder Operation and Service Manual for details.

Common: CALCOM - calculations common

Accessed By: BEGIN, CALC, CNTRL, CONDSP, DUMP, FWINDO, MNS, SO

byte name	description
0 KOSINE(513)	Table of cosine values ranging from 77777 to 0
1026 IFFT	Inverse FFT request flag
1028 FWND(32)	Frequency windows
1092 FMD(8)	Values of MD associated with FWND

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Appendix B - PUT common descriptions

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Common: DBGCOM - debug parameters

Accessed By: CONDSP, LSIINT, SCAN3, WRTBUF in PUT

Also: CNDSPX, LSINTX, SCANXC in XC

byte name	description
0 TFCNT	Missed point count
2 BLKMR	Block not ready flag/count
4 SPCNT	Scan pass count

Note: In XC, only TFCNT is present

Common: DSPCOM - display common

Accessed By: BEGIN, BEGIN1, CNTRL, CONDSP, DISPLA, DUMP, FPLOT, FWINDO,  
PAXIS, PLTW, RDT, RECOR3, SCNDSP, SEAR3, TWINDO, WINT, WPH, VIEW,  
XAMIN, ZOOM in PUT

Also: BEGXC, CNTRXC, CONDSP, DISPXC, DUMPXC, SEARXC, TWINDX, XCAXIS,  
ZOOMXC in XC

byte name	description
0 DTYPE	Display type: 0=Raw data, 1=MFFT, 2=PFFT, 3 =IFFT, 4= Full scan, 5=Subscan
2 MINX	Minimum of data domain in screen units
4 MAXX	Maximum of data domain in screen units
6 MINY	Minimum of data range in screen units
8 MAXY	Maximum of data range in screen units
10 XO	X coordinate of data origin in screen units
12 YO	Y coordinate of data origin in screen units
14 XLO	X axis minimum in data units
16 XHI	X axis maximum in data units
18 YLO	Y axis minimum in data units
20 YHI	Y axis maximum in data units
22 DX	Tic spacing in data units for X
24 DY	Tic spacing in data units for Y
26 XLNC	Tic spacing in screen units for X
28 XTLC(3,12)	6 character ASCII tic labels for X
100 YLNC	Tic spacing in screen units for Y
102 YTLBL(3,12)	6 character ASCII tic labels for Y
174 NDBX	Number of digits behind decimal on X tic labels
176 NDBY	Number of digits behind decimal on Y tic labels
178 TWND(4,8)	Time windows X low, Y low, X high, Y high
242 TWNDT(8)	Time window types (see TWINDO description)
250 PNT(2)	Coordinates of input point in data units
252 XWDTH	Width of screen in screen units
254 YHGTH	Height of screen in screen units
256 XWL	Low X limit of window to be plotted
258 YWL	Low Y limit of window to be plotted
260 XWH	High X limit of window to be plotted
262 YWH	High Y limit of window to be plotted
264 WTP	Type of window to be plotted
266 WCHAR	Character entered with first window point
268 TWOFFS	Time window offset. Shifts windows on time axis

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Common: IBUF - incoming data buffer

Accessed By: AVGR, B81, BEGIN, BSETUP, CALC, CONDSP, DISPLA, DUMP, MNS,  
RDT, RECORD, SO, SCAND, SEARCH, TEKMOD, WPH, WSH, ZOOM in PUT

Also: BEGXC, CONDSP, DISPXC, DUMPXC, SEARXC, TEKMDX, XCAXIS, ZOOMXC in XC

byte name	description
0 IUTS	Sample duration units
2 IRNG	Sample duration range
4 ITYP	Interrupt mode (Priority = 1/NPR = 2)
6 IDTH	Data transfer mode (single/double)
8 MODE	Output mode (Off/Auto/Edit)
10 IERR	Error flag
12 IOFFSC	Offscale indicators
14 IWDSTR	Word start value
16 ISTREC	Start recording value
18 IEDREC	End recording value
20 COFFS(2)	Ch A/Ch B offset (for output only)
24 CRNG(2)	Ch A/ Ch B range (for output only)
28 IBUF(2048)	Raw data buffer

note: See Biomation Model 8100 Waveform Recorder Operation and Service Manual for details.

Common: NTRCOM - inter module common

Accessed By: AVGR, BEGIN, CALC, CNTRL, CONDSP, DISPLA, FWINDO, MNS,  
PLTW, TWINDO, VIEW, WINT, WPH, WSH, XAMIN, ZOOM

byte	name	description
0	IEXIT	Exit request flag
2	MDATA	2050 word buffer for calculated data
10006	MD	When set indicates first 1024 words of MDATA need 2 digits behind decimal.
10010	RENTX	1st option to be selected on reentry to CNTRL
10012	STARTX	Low limit of data in IBUF to be processed
10014	STOPX	High limit of data in IBUF to be processed
10016	FSTART	Low limit of frequency data to be plotted
10020	FSTOP	High limit of frequency data to be plotted
10022	RENTX2	Option to be selected after RENTX, -1 if inactive
10024	FWACT	Frequency windowing active flag
10026	IACT	Interpolating active flag
10030	XACT	XAMIN mode active flag
10032	SSACT	Same scan active flag
10034	IREPT	Number of scans to be averaged
10036	REPKN	Current count of averaged scans

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Common: RCDCOM - recording common.

Accessed By: BEGIN, BEGIN1, CNTRL, SCNDSP, DSETUP, FCLOSE, RECORD,  
RKM0D, S2, SCAND, SEARCH, TWINDO, WPH, WRTBUF, WSH

byte name	description
0 RON	Recording on flag
2 FBPNT	File block pointer, contains absolute address of RAD50 file block. If zero, no active file.
4 RBUF(4)	RAD50 file block for optional file
12 FBL	File buffer length. Always = 10.
14 FBUF(10)	ASCII filename buffer (bytes)
24 DFLT(4)	RAD50 fileblock for default file
32 DBL	Default filename buffer length Always = 10
34 DFBUF(10)	ASCII filename of default file
44 FSTAT	File status, 1 = existing file
46 FSTAT1	Device full flag (no room for file)
48 WCHNUM	Write channel number for recording data
50 RCHNUM	Read channel number
52 CHNUM	Active channel number
54 BLKNUM	Number of current block in file
56 BLKCNT	Block count ; total number of blocks in file
58	Unused
60 THXCD	Threshold exceeded flag
62 OBPNT	OUTBUF pointer
64 XDCRID(6)	Transducer Identification, ASCII
70 SMPLID(6)	Sample Identification, ASCII
76-78	Unused
80 READY1	Buffer 1 busy flag
82 READY2	Buffer 2 busy flag
84 BHI1	High limit of buffer 1
86 BHI2	High limit of buffer 2
88 BLOW1	Low limit of buffer 1
90 BLOW2	Low limit of buffer 2
92 BPNT	Buffer pointer - 0/2
94 BUFFEND	High limit of current buffer
96 CRPNT	Completion routine pointer
98 RSTART	Low limit of raw data to be recorded
100 RSTOP	High limit of raw data to be recorded
102-116	Unused
118 OUTBUF(2048)	Compressed data buffer (byte)

Common: SCNCOM - scan common

Accessed By: BEGIN, CNTRL, CONDSP, LSIINT, MNS, RECORD, S1, SCAN, SCAND,  
SCNDSP, SEARC3, TEKMOD, VIEW, WPH, WSH

byte name	description
0 SOURCE	Data source: 0=simulated data, 1=real time data, 2=recorded data, 3=same scan
2 SRCHTP	Search type: 0=no search, 1=total scan, 2=subscan, 3=point scan
4 TX1	Low X coordinate of total scan
6 TY1	Low Y coordinate of total scan
8 TZ1	Low Z coordinate of total scan
10 TX2	High X coordinate of total scan
12 TY2	High Y coordinate of total scan
14 TZ2	High Z coordinate of total scan
16 SX1	Low X coordinate of sub-scan
18 SY1	Low Y coordinate of sub-scan
20 SZ1	Low Z coordinate of sub-scan
22 SX2	High X coordinate of sub-scan
24 SY2	High Y coordinate of sub-scan
26 SZ2	High Z coordinate of sub-scan
28 SBUF(256)	Sub-scan bit map of flaws
540 TBUF(256)	Total scan bit map of flaws
1052 STATUS	Status of scan: -1=no scan, 0=scan complete, 1=scan in progress, 2=new scan
1054-1056	Unused
1058 XPNT	X coordinate of point scan destination
1060 YPNT	Y coordinate of point scan destination
1062 ZPNT	Z coordinate of point scan destination
1064 NCDR(7)	Encoder readings
1078 XLIM1	Low X limit of active scan
1080 YLIM1	Low Y limit of active scan
1092 XLIM2	High X limit of active scan
1084 YLIM2	High Y limit of active scan
1086 COMAND	Command to LSI-11. See section on SCAN
1088 CMDAT(9)	Command data to LSI-11
1106 NCDRCV	Encoder readings recieved flag
1108 SCNFIN	Scan finished flag
1110 AXIS	Scan axis 0/1 --> X/Y
1112 NUMPNT	Number of points on scan axis
1114 DXMIN	Scan increment
1116 LSIDAT(11)	Data from LSI-11. Only first 4 words are used. See section on SCAN
1138 ERROR	Scan error count or flag
1140 ARIVED	Move command completion flag
1142 COMIP	Communications in progress flag
1144 OFSF	Offset scan flag

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Common: TEKCOM - Tektronix common  
Accessed By: BALL, CNTRL, DSETUP, DUMP, S0, S1, S2, SCAND, TC, TWINDO,  
VIEW

byte name	description
0 ICHBUF	Input character buffer from Tektronix terminal
2 LBLUP	Label up flag

Appendix C

PUT Module Listings



AVCR RT-11 HACRO V032-12 21-NOV-79 PAGE 1+

SYMBOL TABLE

AVCR	000000RC	FIN	000130R	IBUF	000034R	002	IREPT	010034R	003	MDATA	0000002R	003
PC	=%0000007	REPKN	010036R	R0	=%0000000		R1	=%0000001		R2	=%0000002	
R3	=%0000003	R4	=%0000004	R5	=%0000005		SP	=%0000006				
. A03.	0000000											
	000144											
IBUF	010034											
ETR00H	010040											
ERR003	DETECTED: 0											
FREE CORE:	17132. WORDS											
,BKI:AVCR/N:TTL/E:LC=AVCR												

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```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
      000000 016502 000004 000000
      000000 017501 000002 000000
      000010 005000 000001 000000
      000020 073027 000000 000000
      000022 062700 000000 000000
      000026 110022 000005 000000
      000032 012703 000000 000000
      000034 005000 000003 000000
      000040 073027 000000 000000
      000042 062700 000000 000000
      000046 110022 000000 000000
      000052 077307 000000 000000
      000054 000207 000001 000000
      000056 000000 000000 000000
      000066 000001 000000 000000

      B2A0:
      0123
      4(R5),R2
      MOV 2(R5),R1
      CLR R0
      ASHC #1,R0
      ADD #60,R0
      MOV R0,(R2)+
      MOV #5,R3
      CLR R0
      ASHC #3,R0
      ADD #50,R0
      MOV R0,(R2)+
      SOB R3,IS
      UNSAVE 3210
      RTS PC
      .END

      IS:

```

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SYMBOL TABLE

E2A0 00000000 PC  
R3 =X0000003 R4  
 . AHS. 000000 000  
 000070 001  
ERRORS DETECTED: 0  
FREE CORE: 17106. WORDS  
 .DK1:E2A0/N:TTM/E:LC=E2A0

R0 =X0000007  
R5 =X0000004  
R6 =X0000000  
R7 =X0000003  
R8 =X0000000  
R9 =X0000001  
R10 =X0000006  
R11 SP

R2

R10 =X0000001  
R11 =X0000006

R1 SP

R2 =X0000000  
R3 =X0000003

R4

R5 =X0000007  
R6 =X0000004

R7

R8

R9

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```

1  .TITLE B81
2  .GLOBL FLCT
3  .GLOBL BU100
4
5  ;BIOMATION B100 PACKAGE
6
7  B8100 26-JUL-76/MOD 29-JUL-77/MOD 11-JUL-79
8  THIS ROUTINE DOES THE ACTUAL DATA TRANSFER FROM
9  THE BIOMATION MODEL B100 TO THE PDP 11/45
10 COMPUTER MEMORY.
11
12 .MCALL SAVE, UNSAVE, .RECDEF
13 .RECDEF
14
15 DEFINE PROCESSOR ADDRESSES FOR B100
16
17 STREG = 164040 ;STATUS REGISTER
18 CTREG = 164042 ;CONTROL REGISTER
19 WCREG = 164044 ;WORD COUNT REGISTER
20 BAREG = 164046 ;BUS ADDRESS REGISTER
21 WAREG = 164050 ;WORD START REGISTER
22 RDREC = 164052 ;READ DATA REGISTER
23 PCDONE = 270 ;PROGRAM DONE INTERRUPT VECTOR
24 PCPS = 272 ;PROGRAM DONE INTERRUPT STATUS
25 NPDERR = 274 ;NPR DONE OR ERROR VECTOR
26 NPUPS = 276 ;NPR DONE OR ERROR STATUS
27 UNITNO = 7 ;UNIT NUMBER IS 7
28 SVR = 177570
29
30 B8100: SAVE 012
31 TV:
32
33 MOV 000000
34 MOV 000006
35 MOV 000014
36 MOV 000022
37 MOV 000030
38 MOV 000036
39 MOV 000042
40 MOV 000048
41 MOV 000054
42 MOV 000060
43 MOV 000066
44 MOV 000072
45 MOV 000078
46
47
48
49
50
51
52
53
54
55
56
57

```

; -1, IEER ; CLEAR ERROR FLAG  
 ; 300, 0 PCPS ; SET INTERRUPT LEVEL 6 FOR LOC. 270  
 ; 300, 0 NPUPS ; SET INTERRUPT LEVEL 6 FOR LOC. 274  
 ; NPR INTERRUPT  
 ; NPRINT, 0 NPDERR  
 ; IDTH, 0  
 ; CLR STWD ; GET STATUS WORD  
 ; STS-1(R0), STWD ; WORD COUNT  
 ; 204B., R0 ; DIVIDE BY 2 FOR DOUBLE WORD COUNT  
 ; IDTH, 1  
 ; 23  
 ; ASR R0 ; NEGATE WORD COUNT  
 ; NEG R0 ; SAVE WORD COUNT  
 ; R0, WCRD  
 ;
 ; MAIN DATA TAKING SEQUENCE  
 ; RDSTS, 0 CTREG ; READ STATUS  
 ; 020000, 0 RDREC ; WAIT FOR "READY TO ARM"  
 ; BEQ 13  
 ; "READY TO ARM" INDICATES RECORD SWEEP HAS BEEN COMPLETED SINCE LAST ARM  
 ; WCRD, 0 WCREG ; SET UP WORD COUNT REC  
 ; IBUF, 0 BAREG ; BUFFER ADDRESS FOR NPR  
 ; INTFLC  
 ; STWD, 0 STREG ; STATUS REGISTER  
 ; DOUTEN, 0 CTREG

BDI

:DIAGNOSTIC 8100 P RT-11 MACRO VMD2-12 21-NOV-79 PAGE 1+

58 000152	005767	000142	TSTF:	TST	INTFLG	
59 000153	001775			BEQ	TSTF	
60 000156	004767			JSR	PC, FLAG	
61 000160	012737	164042		MOV	OFF, 0-CTREC	
62 000164	004767	000000		JSR	PC, FLAG	
63 000172	012737	164042	RSTR:	MOV	EDIT, 0-CTREC	
64 000176	004767	000000		JSR	PC, FLAG	
65 000204	004767	000000				
66						
67						
68						
69 000210	022767	000001	EXTSCH:	CMF	1, 10TH	
70 000216	001007			RNE	OUT	
71						
72 000220	012700	004060		MOV	2048, R0	
73 000224	012701	000034	EXT:	MOV	1000, R1	
74 000230	111102			MOV	(R1), R3	
75 000232	010221		EXLP:	MOV	R2, (R1)+	
76 000234	077003			SUB	R0, EXLP	
77 000236			OUT:	UNSAVE	310	
78 000244	000207			RTS	PC	

: RETURN TO CALLING PROGRAM

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

**C-8**



1	000310	114	104	STS:	.BYTE	114,104	
2				:			
3				:	VARIABLES		
4	000312	000000		WDT2:	.WORD	0	
5	000314	000000		WDT4:	.WORD	0	
6	000316	000000		WDCNT:	.WORD	0	
7	000320	000000		INTFLG:	.WORD	0	
8	000322	000000		STWD:	.WORD	0	
9	000324	000000		VCWD:	.WORD	0	
10	000326	000000		RSWD:	.WORD	0	
11	000330	000000		TVAL:	.WORD	0	
12				:			
13				:			
14		000000		.CSECT	IBUF		
15	000330	000000		IUTS:	0		
16	000302	000000		IRNG:	0		
17	000304	000000		ITYP:	0		
18	000306	000000		ITPM:	0		
19	000310	000000		MODE:	0		
20	000312	000000		IERR:	0		
21	000314	000000		IOFFSC:	0		
22	000316	000000		IWDSTR:	0		
23	000322	000000		ISTREC:	0		
24	000322	000000		IEDREC:	0		
25	000324	000000	000000	COFFS:	0.0		
26	000330	000000	000000	CRNG:	0.0		
27	000334	000001		IBUF:	.BLKW	2048.	
28					.END		

;SAMPLE INTERVAL UNITS(0-2) REF: B8100 MANUAL P56  
 ;SAMPLE INTERVAL RANGE(0-9) REF: B8100 MANUAL P57  
 ;INTERRUPT TYPE PRI OR NPR,  
 ;DATA TRANSFER MODE, SINGLE OR DOUBLE  
 ;OUTPUT MODE, AUTO OR EDIT  
 ;RETURN ERROR CODE -1 => NO ERROR  
 ;OFF SCALE VALUE ERROR  
 ;WORD START VALUE  
 ;START RECORD  
 ;END RECORD

ANF = 164420  
 COFFS 00024R 002  
 DOUTEN= 163400  
 FLCT = \*\*\*\*\* C  
 INTFLG 000320R 002  
 IUI3 000000R 002  
 NP'DERR= 000274  
 OUT 000336R  
 RDREG = 164032  
 R1 = 0000001  
 SP = 0000006  
 TRIGF = 164410  
 WREG = 164044  
 WREG = 164050  
 . ABS. 000000 000  
 IBUF 010334 001  
 IBUF 010334 002  
 ERRORS DETECTED: 0  
 FREE CORE: 16937. WORDS  
 AUTO = 167001  
 CRNG 000030R  
 EDIT = 167002  
 IBUF 000034R  
 IOFFSC 000014R  
 IWDSTR 000016R  
 NFRDN 000274R  
 PC 0000007  
 RUSTS = 165000  
 R2 = 0000002  
 STREG = 164040  
 TSIF 000152R  
 WCWD 000324R  
 WWD 000326R  
 BAREG = 164046  
 CTREC = 164042  
 EXLP 000230R  
 IDTM 000006R  
 IRNG 000092R  
 MANAL = 164000  
 NPRINT 000246R  
 PCDONE= 000270  
 RESETF= 164401  
 R3 = 0000003  
 STS 000310R  
 TV 000006R  
 WDCNT 000316R  
 B8100 000000RC  
 CUDSF = 164600  
 EXT 000220R  
 IEDREC 000022R 002  
 ISTREC 000020R 002  
 MODE 000010R  
 NPRPS = 000276  
 PCPS = 000272  
 RSTR 000176R  
 R4 = 0000004  
 STVD 000322R  
 TVAL 000330R  
 WDT2 000312R  
 CNTRCP= 164010  
 DLOOF 000100R  
 EXTSCN 000210R  
 IERR 000012R  
 ITYP 000004R  
 NCOM 000054R  
 OFF = 167000  
 PLOTF = 164500  
 N9 = 0000000  
 R3 = 0000005  
 SWR = 177570  
 UNITNO= 000007  
 WDT4 000314R

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

1	.TITLE	BEGIN	BEGIN	BEGIN, BEGIN, SCST
2	.CLOBL	BEGIN, BEGIN, SCST	BEGIN, BEGIN, SCST	BEGIN, BEGIN, SCST
3	.MCALL	SAVE, UNSAVE, .REGDEF	SAVE, UNSAVE, .REGDEF	SAVE, UNSAVE, .REGDEF
4	.REGDEF	SAVE	SAVE	SAVE
5	000000	BEGIN:	000000	000000
6	000000		000000	000000
7	000012		000012	000012
8	000020		000020	000020
9	000026		000026	000026
10	000032		000032	000032
11	000036		000036	000036
12	000042		000042	000042
13	000050		000050	000050
14	000056		000056	000056
15	000064		000064	000064
16	000072		000072	000072
17	000100		000100	000100
18	000106		000106	000106
19	000114		000114	000114
20	000122		000122	000122
21	000130		000130	000130
22	000136		000136	000136
23	000144		000144	000144
24	000152		000152	000152
25	000160		000160	000160
26	000166		000166	000166
27	000174		000174	000174
28	000202		000202	000202
29	000210		000210	000210
30	000216		000216	000216
31	000224		000224	000224
32	000232		000232	000232
33	000240		000240	000240
34	000244		000244	000244
35	000250		000250	000250
36	000254		000254	000254
37	000262		000262	000262
38	000270		000270	000270
39	000276		000276	000276
40	000304		000304	000304
41	000312		000312	000312
42	000320		000320	000320
43	000326		000326	000326
44	000334		000334	000334
45	000340		000340	000340
46	000344		000344	000344
47	000350		000350	000350
48	000354		000354	000354
49	000362		000362	000362
50	000366		000366	000366
51	000374		000374	000374
52	000402		000402	000402
53	000406		000406	000406
54	000412		000412	000412
55	000416		000416	000416
56	000424		000424	000424
57	000430		000430	000430

.TITLE  
 .CLOBL  
 .MCALL  
 .REGDEF  
 BEGIN  
 BEGIN, BEGIN, SCST  
 SAVE, UNSAVE, .REGDEF  
 BEGIN:  
 000000  
 000000  
 000012  
 000020  
 000026  
 000032  
 000036  
 000042  
 000050  
 000056  
 000064  
 000072  
 000100  
 000106  
 000114  
 000122  
 000130  
 000136  
 000144  
 000152  
 000160  
 000166  
 000174  
 000202  
 000210  
 000216  
 000224  
 000232  
 000240  
 000244  
 000250  
 000254  
 000262  
 000270  
 000276  
 000304  
 000312  
 000320  
 000326  
 000334  
 000340  
 000344  
 000350  
 000354  
 000362  
 000366  
 000374  
 000402  
 000406  
 000412  
 000416  
 000424  
 000430

PC, BEGIN  
 #50., DXIN  
 #200., NUPNT  
 TDLY1  
 TDLY2  
 TDLY3  
 #9., TLEVI  
 #1, TSRC  
 #0, TSLOP  
 #0, TCOUP  
 #1, TLEVS  
 #1, TUNT  
 #1, ASEL  
 #2, AAPC  
 #2, ABPC  
 #2, AAMC  
 #2, ABMC  
 #5, ARNG  
 #1, ACHM  
 #1, APOL  
 #2, ITYP  
 #2, IDTH  
 #2, NODE  
 #1, INDIR  
 #3, ISTREG  
 #0, IUTN  
 #1, IRNG  
 AMODE  
 TMODE  
 ASRC  
 #1, ACNT  
 #1, BCNTR  
 #1, BSEL  
 #0, BCHM  
 #0., ADLY1  
 #0., ADLY2  
 #9., ALEV1  
 #9., ALEV2  
 DTYPE  
 MINX  
 MAXX  
 STARTX  
 #2047., STOPX  
 FSTART  
 #1023., FSTOP  
 #1, RENTR2  
 FVACT  
 IACT  
 SSACT  
 #64., THRESH  
 #40., R2  
 #FWD, R1

### SET UP COSINE TABLE

**C-13**

115 010040	000000	TURSH:	.WORD	0	DSPCOM
116 000000	000000	DTYPE:	.CSECT	0	
117 000000	000000	MINX:	.WORD	0	
118 000002	000000	MAXX:	.WORD	0	
119 000004	000000		.CSECT	0	ATPARA
120 000000	000000	ADLY1:	0		
121 000000	000000	TDLY1:	0		
122 000002	000000	ADLY2:	0		
123 000004	000000	TDLY2:	0		
124 000006	000000	ADLY3:	0		
125 000010	000000	TDLY3:	0		
126 000012	000000	ALEVS:	0		
127 000014	000000	TLEVS:	0		
128 000016	000000	ALEVI:	0		
129 000020	000000	TLEVI:	0		
130 000022	000000	ALEV2:	0		
131 000024	000000	TLEV2:	0		
132 000026	000000	AHODE:	0		
133 000030	000000	TNODE:	0		
134 000032	000000	ASRC:	0		
135 000034	000000	TSRC:	0		
136 000036	000000	AISRC:	0		
137 000040	000000	TISRC:	0		
138 000042	000000	ASLOP:	0		
139 000044	000000	TSLOP:	0		
140 000046	000000	ACOUF:	0		
141 000050	000000	TCOUF:	0		
142 000052	000000	ACNT:	0		
143 000054	000000	TCNT:	0		
144 000056	000000	ASEL:	1		
145 000060	000001	ESEL:	0		
146 000062	000000	ACHTR:	0		
147 000064	000000	BCNTR:	0		
148 000066	000000	AAPC:	2		
149 000070	000002	ABPC:	2		
150 000072	000002	AAPC:	2		
151 000074	000002	ABPC:	2		
152 000076	000002	ABPC:	2		
153 000100	000000	ABPC:	0		
154 000102	000000	BOFFS:	0		
155 000104	000000	BOFFS:	0		
156 000106	000000	BOFFS:	0		
157 000110	000001	ACHN:	1		
158 000112	000000	ACHN:	0		
159 000114	000001	APOL:	1		
160 000116	000000	BPOL:	0		
161		:			
162		:			
163		:			
164		:			
165		:			
166			CONTON	IBUF	
167 000000	000000	IUTS:	0		
168 000002	000000	IRNG:	0		
169 000004	000002	ITYP:	2		
170 000006	000002	IDTH:	2		
171 000010	000002	NODE:	2		

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

BEGIN RT-11 MACRO VM22-12 21-NOV-79 PAGE 1+

172 000012	000000		
173 000014	000000		
174 000016	000001		
175 000020	000002		
176 000022	000000		
177 000024	000000		
178 000030	000000		
179 000034	000001		
180			

INTR:	0
IOFFSC:	0
INDSTR:	1
ISCREG:	2
INDREG:	0
COFFS:	0.0
CRHC:	0.0
IBUF:	.BLKW 2048.
	.END

SYMBOL TABLE

AANC	000074R	006	AAPC	000070R	006	ABMC	000076R	006	ABPC	000072R	006	ACHM	000110R	006
ACHT	000034R	006	ACRTR	000064R	006	ACOUF	000050R	006	ADLY1	000000R	006	ADLY2	000004R	006
ADLY3	000010R	006	AISRC	000040R	006	ALEVS	000014R	006	ALEV1	000020R	006	ALEV2	000024R	006
ADDE	000030R	006	AOFFS	000104R	006	APOL	000114R	006	ALNC	000100R	006	ASEL	000060R	006
ASLOP	000044R	006	ASRC	000034R	006	BCHM	000112R	006	BCNTR	000066R	006	BEGIN	000000R	006
BEGIN1=	***** G		BOFFS	000106R	006	BPOL	000116R	006	BRNG	000102R	006	BSEL	000062R	006
BI	000434R	002	COFFS	000024R	007	CHMG	000030R	007	DTYPE	000000R	003	DUNNY	000522R	004
BRUN	002132R	004	FIN	000354R	003	FMD	002104R	004	FSTART	010016R	004	FSTOP	010020R	007
FWACT	010024R	007	FUND	002004R	007	IACT	010026R	004	IBUF	000034R	007	IDTH	000006R	004
IEDREC	000022R	007	IERR	000012R	007	IFFT	002002R	003	IOFFSC	000014R	007	IREFP	010034R	004
IIRC	000002R	003	ISTREC	000020R	007	ITYP	000004R	007	IUTS	000000R	007	INDESTR	000016R	007
KOSINE	000000R	003	NAXX	000004R	005	NINX	000002R	005	MODE	000010R	007	NUMPNT	002130R	002
PC	=X00007		RENTRE2	010022R	004	REPNT	010036R	004	IN0	=X000000		R1	=X000001	
R2	=X000002		R3	=X000093		R4	=X000004		R3	=X000005		SBUP	000034R	002
SCST	= ***** G		SOURCE	000000R	002	SP	=X000006		SRCHTP	000002R	002	SSACT	010032R	004
STARTX	010012R	004	STATUS	002034R	002	STOPX	010014R	004	TBUF	001034R	002	TCNT	000056R	006
TCOUP	000032R	005	TDLY1	000032R	006	TDLY2	000006R	006	TDLY3	000012R	006	THRESH	010040R	004
TISRC	000042R	006	TLEVS	000016R	006	TLEVI	000022R	006	TLEV2	000026R	006	THODE	000032R	006
TSLOP	000046R	006	TSRC	000036R	006	TX1	000004R	002	TX2	000012R	002	TY1	000006R	002
TY2	000014R	002	TZ1	000010R	002	TZ2	000016R	002	XACT	010030R	004			
. ABS.	000000	000												
SCNCON	002134	001												
CALCON	002124	002												
NTRCON	010042	003												
DSPCON	000006	004												
ATPARA	000120	005												
IBUF	010034	006												
ERRORS DETECTED:	0	007												
FREE CORE:	16792. WORDS													

.DK1:BEGIN/N:TTM/E:LC-BEGIN



**C-18**

BSIETUP RT-11 MACRO VMD-12 21-NOV-79 PAGE 1\*

114 000020	000000	ISTREC:	0
115 000022	000000	IFDREC:	0
116 000024	000000	COFFS:	0.0
117 000030	000000	CRNG:	0.0
118 000034	000000	IBUF:	0.0
119	000001		.BLKW 2048.
			.END

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

AAFC	000074R	002	AAFC	000070R	002	ABNC	000076R	002	ABFC	000072R	002	ACBR	000110R	002
ACID	= ***** G		ACNT	000054R	002	ACNTR	000064R	002	ACDMP	000050R	002	ADLY	= ***** G	
ADLY1	000000R	002	ADLY2	000004R	002	ADLY3	000010R	002	AISMC	000040R	002	ALVS	000014R	002
ALFV1	000020R	002	ALEV3	000024R	002	ADHDE	000030R	002	AISMC	000044R	002	APOL	000114R	002
ANH	= ***** G		ARNC	000100R	002	ASEL	000060R	002	ASLOP	000048R	002	ASNC	000034R	002
BCHN	000112R	002	BCNTR	000064R	002	BOFFS	000106R	002	BPOL	000042R	002	BRESET	= ***** G	
BRNC	000102R	002	BSEL	000050R	002	BSETUP	000060R	002	CBUP	000040R	002	CUFFS	000024R	002
CHNC	000050R	002	CTREP	000052R	002	FLCT	= ***** G		IBUP	000034R	002	IDTN	000020R	002
IEUREC	000022R	002	IUTS	000012R	002	IOFTSC	000014R	002	IRNG	000022R	002	ISTHCC	000006R	002
ITYP	000004R	002	IEUL	000000R	002	IVSTR	000016R	002	MDSE	000010R	002	OUTN	= ***** G	
PC	= ***** G		RECDN	= ***** G		RT	000034R	002	NO	= ***** G		R1	= ***** G	
RC	0000207	002	R3	= ***** G		R4	= ***** G		RS	= ***** G		SETCA	= ***** G	
SETCB	= ***** G		SET1A	= ***** G		SET1B	= ***** G		SETMA	= ***** G		SETNB	= ***** G	
SP	= ***** G		TCND	= ***** G		TCNT	000056R	002	TCNUP	000052R	002	TALY	= ***** G	
TALY1	000002R	002	TALY2	000006R	002	TALY3	000012R	002	T1	000050R	002	TIMER	= ***** G	
TISRC	000042R	002	TLEVS	000016R	002	TLEVI	000022R	002	TLEV2	000036R	002	TBASE	= ***** G	
THDSE	000032R	002	TRICER	= ***** G		TSLOP	000046R	002	TSRC	000034R	002			
. ABS.	000000	000												
ATTADA	000552	001												
IDWF	000120	002												
ERRING3 DETECTED: 0	010034	003												

FIRE CODE: 16373. WORDS

.DK1:BSETS/N:TTM/E:LC-BSETS

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

1  TITLE BEGIN
2  .GLOBL LSTINT, WCR1, BEGINI
3  .MCALL .SRESET, .RECEP
4  .RECEP
5  INITIALIZE NEDCON
6  BEGINI:
7  CLR R0N
8  CLR FUPNTR
9  CLR FBUF
10 CLR FSTAT
11 CLR FSTAT1
12 CLR CHNUN
13 CLR BLKUN
14 CLR BLKCT
15 CLR TEXCD
16 CLR OUTNTR, ORPNTR
17 CLR *12..R0
18 CLR *40, XDCR1B-1(R0)
19 CLR R0, 12
20 CLR READY1
21 CLR READY2
22 CLR RPNTR
23 CLR *OUTNTR+1024..RUFEND
24 CLR *WCR1, CRPNTR
25 CLR *1024..R0
26 CLR OUTNTR-2(R0)
27 CLR R0
28 CLR R0, 23
29 CLR *LSTINT, *344
30 CLR *346
31 CLR *40, *167740
32 CLR RSTART
33 CLR *2047..RSTOP
34 CLR *SRESET
35 CLR TNDT
36 CLR TNDT+2
37 CLR TNDT+4
38 CLR TNDT+6
39 CLR WTP
40 CLR PC
41 CLR NEDCON
42 CLR *RECORDING ON FLAG
43 CLR *FILE BLOCK POINTER
44 CLR *RANGE FILE BLOCK
45 CLR *FILE STATUS 1-OLD
46 CLR *FILE STATUS NO ROOM ON DK1
47 CLR *THRESHOLD EXCEEDED FLAG
48 CLR *OUTNTR POINTER
49 CLR *R0N
50 CLR *FUPNTR
51 CLR *RBUF
52 CLR *FBL
53 CLR *FBUF
54 CLR *DBL
55 CLR *DFBUF
56 CLR *FSTAT
57 CLR *FSTAT1
58 CLR *CHNUN
59 CLR *BLKUN
60 CLR *BLKCT
61 CLR *TNDT
62 CLR *ORPNTR
63 CLR *R0N
64 CLR *FUPNTR
65 CLR *RBUF
66 CLR *FBL
67 CLR *FBUF
68 CLR *DBL
69 CLR *DFBUF
70 CLR *FSTAT
71 CLR *FSTAT1
72 CLR *CHNUN
73 CLR *BLKUN
74 CLR *BLKCT
75 CLR *TNDT
76 CLR *ORPNTR
77 CLR *R0N
78 CLR *FUPNTR
79 CLR *RBUF
80 CLR *FBL
81 CLR *FBUF
82 CLR *DBL
83 CLR *DFBUF
84 CLR *FSTAT
85 CLR *FSTAT1
86 CLR *CHNUN
87 CLR *BLKUN
88 CLR *BLKCT
89 CLR *TNDT
90 CLR *ORPNTR
91 CLR *R0N
92 CLR *FUPNTR
93 CLR *RBUF
94 CLR *FBL
95 CLR *FBUF
96 CLR *DBL
97 CLR *DFBUF
98 CLR *FSTAT
99 CLR *FSTAT1
100 CLR *CHNUN
101 CLR *BLKUN
102 CLR *BLKCT
103 CLR *TNDT
104 CLR *ORPNTR
105 CLR *R0N
106 CLR *FUPNTR
107 CLR *RBUF
108 CLR *FBL
109 CLR *FBUF
110 CLR *DBL
111 CLR *DFBUF
112 CLR *FSTAT
113 CLR *FSTAT1
114 CLR *CHNUN
115 CLR *BLKUN
116 CLR *BLKCT
117 CLR *TNDT
118 CLR *ORPNTR
119 CLR *R0N
120 CLR *FUPNTR
121 CLR *RBUF
122 CLR *FBL
123 CLR *FBUF
124 CLR *DBL
125 CLR *DFBUF
126 CLR *FSTAT
127 CLR *FSTAT1
128 CLR *CHNUN
129 CLR *BLKUN
130 CLR *BLKCT
131 CLR *TNDT
132 CLR *ORPNTR
133 CLR *R0N
134 CLR *FUPNTR
135 CLR *RBUF
136 CLR *FBL
137 CLR *FBUF
138 CLR *DBL
139 CLR *DFBUF
140 CLR *FSTAT
141 CLR *FSTAT1
142 CLR *CHNUN
143 CLR *BLKUN
144 CLR *BLKCT
145 CLR *TNDT
146 CLR *ORPNTR
147 CLR *R0N
148 CLR *FUPNTR
149 CLR *RBUF
150 CLR *FBL
151 CLR *FBUF
152 CLR *DBL
153 CLR *DFBUF
154 CLR *FSTAT
155 CLR *FSTAT1
156 CLR *CHNUN
157 CLR *BLKUN
158 CLR *BLKCT
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161 CLR *R0N
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163 CLR *RBUF
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165 CLR *FBUF
166 CLR *DBL
167 CLR *DFBUF
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169 CLR *FSTAT1
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993 CLR *DFBUF
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995 CLR *FSTAT1
996 CLR *CHNUN
997 CLR *BLKUN
998 CLR *BLKCT
999 CLR *TNDT
1000 CLR *ORPNTR

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58 000100	XCRID:	.BLK	6	:TRANSDUCER ID
59 000106	STPLID:	.BLK	6	:SAMPLE ID
60		.BLK	2	
61 000120	READY1:	.WORD	0	:BLACK 1 BUSY FLAG
62 000122	READY2:	.WORD	0	:BLACK 2 BUSY FLAG
63		.BLK	4	
64 000124	DPNTR:	.WORD	0	:BLACK POINTER
65 00 136	DUPEND:	.WORD	0	:HI ADDRESS OF ACTIVE BUFFER
66 000140	CRPNTB:	.WORD	0	
67 000142	RESTART:	.WORD	0	
68 000144	RESTOP:	.WORD	0	
69		.BLK	8	
70 000166	OUTBUF:	.BLK	2048	
71		.CSELT	DSFCOM	
72 000000	DTYPE:	.WORD	0	
73 000002	MINX:	.WORD	0	
74 000004	MAXX:	.WORD	0	
75 000006	MINY:	.WORD	0	
76 000010	MAXY:	.WORD	0	
77 000012	X0:	.WORD	0	
78 000014	Y0:	.WORD	0	
79 000016	XLO:	.WORD	0	
80 000020	XHI:	.WORD	0	
81 000022	YLO:	.WORD	0	
82 000024	YHI:	.WORD	0	
83		.BLK	78	
84 000362	TWID:	.BLK	32	:TIME WINDOWS
85 000362	TWHT:	.BLK	8	:TIME WINDOW TYPES
86 000372	PNT:	.BLK	2	:COORDINATES OF INPUT POINT - SET BY EACH
87 000376	XWTH:	.WORD	0	
88 000380	YWTH:	.WORD	0	
89 000380	XCL:	.WORD	0	:COORDINATES OF WINDOW TO BE PLOTTED IN DATA UNITS
90 000380	YCL:	.WORD	0	
91 000380	XHL:	.WORD	0	
92 000380	YHL:	.WORD	0	
93 000380	WTP:	.WORD	0	:WINDOW TYPE FOR PLTV
94 000380	WCHAR:	.WORD	0	:CHARACTER INTERES WITH FIRST WINDOW POINT
95		.END		

SYMBOL TABLE

BEGIN1	00000000	BLKCNT	000070R	002	BLKNUM	000066R	002	BPNTN	000134R	002	BUFEND	000136R	002
CINUM	000064R	CRPNTR	000140R	002	DBL	000040R	002	DFBUF	000042R	002	DFLT	000030R	002
DTYPE	000000R	FBL	000140R	002	FBNTR	000002R	002	FBUF	000016R	002	FSTAT	000054R	002
FSTAT1	000056R	LSINT=	***** G	002	MAXX	000004R	002	MAXY	000010R	002	MINX	000002R	002
MINY	000006R	OBPNTR	000076R	002	OUTBUF	000166R	002	PC	000007	002	PNT	000372R	002
RUUF	000004R	READY1	000120R	002	READY2	000122R	002	RON	000000R	002	RSTART	000142R	002
RESTOP	000144R	R0	000000	002	R1	0000001	002	R2	0000002	002	R3	0000003	002
R4	0000004	R3	0000005	002	SMPLID	000106R	002	SP	0000006	002	THXCD	000074R	002
TWWD	000262R	TWWD1	000362R	002	WCHAR	000414R	002	WCR1	0000006	002	WTP	000412R	002
XDCR1D	000100R	XH1	000020R	002	XLO	000016R	002	XWDTH	000376R	002	XWH	000406R	002
XWL	000402R	X0	000012R	002	YHGT	000400R	002	YH1	000024R	002	YLO	000022R	002
YWH	000416R	YML	000404R	002	Y0	000014R	002						
. ABS.	000000												
RCDCON	000216												
DSPCON	000416												
ERRORS DETECTED:	0												
FREE CORE:	17043. WORDS												

.DK1:BEGIN1/N:TTM/E:LC-BEGIN1

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



```

53 000220 012767 001232' 00000000 MOV #TEMP,TAD
54 000236 012767 004004' 00000000 MOV #2052.,LTHP
55 000244 012767 000002' 00000000 MOV #NDATA,CTABL+.OBF
56 000252 012767 002000 00000020 MOV #1024.,CTABL+.NLN
57 000260 012767 177770 00000040 MOV #-8.,CTABL+.SCL
58 000268 012767 177770 00000060 MOV #-8.,CTABL+.FLC
59 000274 005067 00000000 CLR INVFC
60 000280 004767 00000000 JSR PC,CFT
61 000286 005702 00000000 TST R2
62 000292 001401 00000000 RCONV
63 000298 00000000 HALT
64 000304 00000000 MOV CTABL+.NLN,R0
65 000310 00000000 ASL R0
66 000316 006300 00000020 RCONV: MOV CTABL+.OBF,R1
67 000322 016701 00000000 ASL R1
68 000328 006100 00000000 MOV R1,R0
69 000334 012120 00000000 ADD (R1)+,(R0)+
70 000340 012116 00000000 MOV (R1)+,(R0)
71 000346 004767 00000000 JSR PC,CTO
72 000352 005702 00000000 TST R2
73 000358 001401 00000000 BEQ 20
74 000364 005003 00000040 INC CTABL+.SCL
75 000370 012702 010024' FVACT
76 000376 003434 0000002' 20: MOV #NDATA,R0
77 000382 001270 00000000 MOV R3
78 000388 005003 00000010 21: MOV #8.,R2
79 000394 012701 002004' 22: MOV #FVND,R1
80 000400 021161 0000004 23: CMP (R1),4(R1)
81 000406 001406 00000000 BEQ 23
82 000412 020311 0000004 24: CMP R3,(R1)
83 000418 002404 0000004 25: BLT 23
84 000424 003001 0000004 26: CMP R3,4(R1)
85 000430 006106 00000010 27: BGT 24
86 000436 002701 00000010 28: ADD #8.,R1
87 000442 077214 00000000 SOB R2,23
88 000448 005020 00000000 CLR (R0)+
89 000454 000402 00000000 BR 25
90 000460 005720 00000000 TST (R0)+
91 000466 005720 00000000 INC R3
92 000472 020327 00000000 CMP R3,#1024.
93 000478 002747 0000002' 29: BLT 21
94 000484 005767 00000000 TST IFFT
95 000490 001447 00000000 CN
96 000496 012767 00000000 MOV #-1,INVFC
97 000502 016700 00000020 CTABL+.NLN,R0
98 000508 006300 00000000 R0
99 000514 016701 00000000 MOV CTABL+.OBF,R1
100 000520 006001 00000000 ASL R0
101 000526 006100 00000000 MOV R0,R1
102 000532 012120 00000000 ADD (R1)+,(R0)+
103 000538 011110 00000000 MOV (R1),(R0)
104 000544 004767 00000000 JSR PC,CTO

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

115 000512 005702
116 000514 001401
117 000516 000900
118 000520 005267
119 000524 004767
120 000530 005702
121 000532 001401
122 000534 000900
123 000536 016701
124 000538 012702
125 000540 012703
126 000542 005401
127 000544 162701
128 000546 011200
129 000548 072901
130 000550 010022
131 000552 077304
132 000554 000167
133 000556 012701
134 000558 012702
135 000560 012703
136 000562 012112
137 000564 012112
138 000566 005722
139 000568 077305
140 000570 034767
141 000572 005702
142 000574 001401
143 000576 000900
144 000578 000900
145
146 000634 012767
147 000636 012767
148 000638 012767
149 000640 012765
150 000642 004767
151 000644 012703
152 000646 012700
153 000648 011004
154 000650 012702
155 000652 010201
156 000654 005704
157 000656 002001
158 000658 005404
159 000660 006201
160 000662 026204
161 000664 002410
162 000666 003902
163 000668 000167
164 000670 032701
165 000672 001007
166 000674 000102
167 000676 000764
168 000678 032701
169 000680 001002
170 000682 160102
171 000684 000757

;PERFORM INVERSE FFT
CTABL+.SCL
PC,CFT
R2
33
R2
33
;SHIFT RESULTS TO CONFORM TO ORIGINAL SCALE FACTOR
CTABL+.SCL,R1
MOV
#HDATA,R2
MOV
#2048.,R3
NEG
R1
SUB
#8.,R1
MOV
(R2),R0
ASH
R1,R0
MOV
R0,(R2)+
SOB
R3,59
JMP
OUT
#HDATA,R1
#TTP2,R2
#1024.,R3
(R1)+(R2)
(R1)+,2048.(R2)
TST
R2
SOB
R3,219
JSR
PC,CXCS
R2
33
;SAVE REAL AND IMAGINARY VALUES
;CALCULATE MAGNITUDE COMPLEX SPECTRUM
CALCULATE PHASE ANGLE
#-1024.,MWNCT
#HDATA,EDIV+2
#HDATA+2048.,EDIV+10.
#EDIV,R5
PC,FN1
#1024.,R3
#HDATA+2048.,R0
(R0),R4
#512.,R2
R2,R1
R4
NXT
R4
R4
ASR
R1
CNP
KOSINE(R2),R4
BLT
23
BGT
13
JMP
FND
BIT
#1,R1
BNE
FND
ADD
R1,R2
BR
NXT
BIT
#1,R1
BNE
FND
SUB
R1,R2
BR
NXT
;SET UP TO CALCULATE COSINES
;FIND ARC-COSINES

```

172 000756	000292	ASR	R2		
173 000760	000402	NEC	R2		
174 000762	002702	ADD	#512.,R2		
175 000766	010223	MOV	R2,(R0)+		
176 000770	077336	SOB	R3,NXV		
177 000772	012704	MOV	#THP2,R4		
178 000776	012702	MOV	#MDATA+2048.,R2		
179 001002	012703	MOV	#1024.,R3		
180 001006	011200	MOV	(R2),R0		
181 001010	070027	NUL	#26400,R0		
182 001014	005714	TST	(R4)		
183 001016	002903	BCE	18		
184 001020	005409	NEC	R0		
185 001022	062703	ADD	#189.,R0		
186 001026	005704	TST	2048.(R4)		
187 001032	002601	BCE	26		
188 001034	005400	NEC	R0		
189 001036	010022	MOV	R0,(R2)+		
190 001040	005724	TST	(R4)+		
191 001042	077317	SOB	R3,LP		
192		SHIFT			
193 001044	016704	MOV	CTABL+,SCL,R4		
194 001050	012702	MOV	#MDATA,R2		
195 001054	012703	MOV	#1024.,R3		
196 001060	003404	NEC	R4		
197 001062	162704	SUB	#8.,R4		
198 001066	016701	MOV	CTABL+,FLC,R1		
199 001072	060401	ADD	R4,R1		
200 001074	029127	CNP	R1,#-10.		
201 001100	003002	BGT	53		
202 001102	003207	INC	ND		
203 001106	011201	MOV	(R2),R1		
204 001110	006709	SXT	R0		
205 001112	005767	TST	ND		
206 001116	001403	BEQ	558		
207 001120	010100	MOV	R1,R0		
208 001122	070027	MUL	#100.,R0		
209 001126	072004	ASHC	R4,R0		
210 001130	020127	CNP	R1,#2		
211 001134	003003	BGT	63		
212 001136	005002	CLR	2048.(R2)		
213 001142	003002	BGT	68		
214 001144	005052	CLR	2048.(R2)		
215 001150	010122	MOV	R1,(R2)+		
216 001152	077323	SOB	R3,58		
217 001154		UNSAVE	543210		
218 001170	000207	RTS	PC		
219 001172	002250	.WORD	2260,0,2,0,0,0,0		
220		EACC:			
220 001210	001402	.WORD	1402,AVG,0,0,2,0,2		
001216	000000	ESUB:			
001224	000000				
221 001226		AVG:			
222 001232		TEMP:			
223 005236		THP2:			
224 015236	002246	EDIV:			

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

```

.CSECT IBUF
.BLKW 14.
.BLKW 2048.
.CSECT NTRCON
.WORD 0
.BLKW 2050.
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.BLKW 3
.WORD 0
.CSECT CALCON
.BLKW 513.
.WORD 0
.BLKW 32.
.END

```

ACUMNII= \*\*\*\*\* G  
CH 000574R  
EDIV 015246R  
FWD 002004R  
KOSINE 000000R  
KVI 000364R  
NXT 000274R  
RENTR 010010R  
R4 =\*\*\*\*\* G  
TAD  
. ORF = 000000  
. ABS. 000000  
IBUF 015234  
ENTRCON 016034  
CALCON 016034  
EALCON 016034  
EALCON 016034  
FREE CODE: 16907.

ACUNLO= \*\*\*\*\*  
CHCS = \*\*\*\*\*  
ESUB 001210R  
IBUF 00034R  
LP 001006R  
HV2 000074R  
NVV 000576R  
R0 = 0000000  
R5 = 0000005  
TEMP 001232R  
SCL = 000004

```

AVG      001226R  G
GTABL    = *****
FND      0007536R
LEXIT    0009090R
LTHP     = *****
MV3      0001144R
OUT      0011544R
R1       =X000001
SP       =X000006
THF2     000236R

```

CALC CTO = 00000000  
CFN1 = \*\*\*\*\* G  
IFFT = \*\*\*\*\* G  
HD FD = 002002R  
MV4 010006R  
PC 000140R  
R2 = X000007  
STARTX = X000002  
FLG = 010012R .

CFT	= ***** G	003
EACC	001172R	003
FVACT	010024R	003
INVTG	= ***** G	003
MDATA	000002R	003
HWDCI	= ***** G	003
HWCONV	000312R	003
EC3	= 0000003	003
STUOPX	010014R	003
.NLN	= 0000002	003

**.DK1:CALC/N:TTM/E:LC=CALC**

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



56 000000	NTRCON:	.BLKW	I
57 000000	IBUF:	.CSECT	IBUF
58 000000		.BLKW	I
59 000000	DSPCON:	.CSECT	DSPCON
60 000000		.BLKW	I
61 000000	ATPARA:	.CSECT	ATPARA
62 000000		.BLKW	I
63 000000	RCDCOM:	.CSECT	RCDCOM
64 000000		.BLKW	I
65 000001		.END	

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

AKSDSP	000074R	ATPARA	000000R	010	CALCOM	000000R	004	COMADR	000122R	CONDSP	000000R
DIACOM	000000R	BSPCOM	000000R	007	IBUF	000000R	005	NTRCOM	000000R	OUT	000000R
PC	=X000007	RCPCOM	000000R	011	R0	=X000000	008	R1	=X000001	R2	=X000002
R3	=X000003	R4	=X000004		R5	=X000005		SCNCOM	000000R	SP	=X000006
TRP	000120R										
.ABS.	000000										
	000142										
DIACOM	000002										
SCNCOM	000002										
CALCOM	000002										
NTRCOM	000002										
IBUF	000002										
LSACOM	000002										
ATPARA	000002										
RCPCOM	000002										
ERROR DETECTED: 0											
FREE CORE: 17070. WORDS											

.BCT: COMDSP/N: TTN/E: LC=CONDSP



58	000336	004767	0000000	JSR	PC, HOME
59	000332	012705	003330	MOV	PC, RSP, R5
60	000336	004767	0000000	JSR	PC, CHOUT
61	000342	003067	0000000	CLR	ICHRUP
62	000346	003767	0000000	TST	ICHRUP
63	000352	001773		REQ	18
64	000354	000167	177426	JMP	CNT1
65	000358	026737	0000000	CMF	ICHRUP, 107
66	000356	001002		BNE	CNT3
67	000370	000167	001330	JMP	OUT
68	000374	026727	0000000	CMF	ICHRUP, 104
69	000402	001074		BNE	CNT6
70	000404	012767	077777	MOV	177777, X10
71	000412	012767	177777	MOV	177777, X11
72	000420	016767	000016	MOV	X10, Y10
73	000426	016767	000020	MOV	X11, Y11
74	000434	003067	000032	CLR	NINX
75	000440	003067	000004	CLR	MAXX
76	000444	003067	002003	CLR	1FFT
77	000450	003067	000000	CLR	ICHRUP
78	000454	004767	000000	JSR	PC, ERASE
79	000460	004767	000000	JSR	PC, HOME
80	000464	012705	002376	MOV	PC, R5
81	000470	004767	000000	JSR	PC, CHOUT
82	000474	003767	000000	TST	ICHRUP
83	000500	001775		REQ	18
84	000502	016767	000000	MOV	ICHRUP, RSP+6
85	000510	016767	000000	MOV	ICHRUP, DTYPE
86	000516	003067	000000	CLR	ICHRUP
87	000522	002767	000000	SUB	169, DTYPE
88	000520	002761		BLT	18
89	000532	026727	000000	CMF	DTYPE, 15
90	000540	003365		BCT	18
91	000542	026727	000000	CMF	DTYPE, 13
92	000550	001053		BNE	38
93	000552	012767	000001	MOV	1, 1FFT
94	000550	012705	020012	MOV	PC, R5
95	000564	004767	000000	JSR	PC, CHOUT
96	000570	003167	001102	JMP	HXTFNC
97	000574	026727	000000	CMF	ICHRUP, 132
98	000582	001056		BNE	CNT7
99	000604	003067	010024	CMF	FVACT
100	000610	010056		CLR	R0, -(SP)
101	000612	010156		MOV	R1, -(SP)
102	000614	012701		MOV	PC, R1
103	000620	012700	002000	MOV	PC, R1
104	000624	003021	000010	MOV	PC, R0
105	000626	077002		CLR	(R1)+
106	000630	012601		SUB	R0, 108
107	000632	012608		MOV	(SP)+, R1
108	000634	016767	000000	MOV	(SP)+, R0
109	000642	003767	000000	TST	ICHRUP, RENTR
110	000646	001407	000000	REQ	18
111	000650	003767		TST	DTYPE
112	000654	001004		BNE	18
113	000656	026767	000000	CMF	NINX, MAXX
114	000664	001004		BNE	23

; CHECK C0 REQUESTED (C)

; CHECK DISPLAY CONTROL REQUESTED (D)

; PRINT DISPLAY REQUEST  
; WAITFOR INPUT

; CHECK ZOOM REQUESTED

; WINDOWS MUST BE REPLACED AFTER ZOOM

; CLEAR WINDOWS

115	000666	005067	000000	18:	CLA	BTYPE
116	000672	000167	001016		JMP	OUT
117	000676	004767	000000	28:	JSR	PC.ZOOM
118	000702	005767	010010		TST	RETR
119	000706	001402			REQ	998
120	000710	000167			JMP	OUT
121	000714	000167		993:	JMP	CNT99
122	000720	026727	000127	CNT7:	CHP	ICHRUF, 127
123	000726	001131			BNE	CNT8
124	000730	016767	000000	18:	MOV	ICHRUF, RETR
125	000736	005767	010022		TST	RETR2
126	000742	003470			BLT	48
127	000744	003633			BGT	48
128	000746	026727	000000		CHP	BTYPE, 1
129	000754	001407	000001		REQ	28
130	000756	012767	000001		MOV	11, BTYPE
131	000764	005067	002002		CLA	17FT
132	000770	000167	000750		JMP	OUT
133	000774	026767	000002	28:	CHP	MINX, MAXX
134	001002	001412			REQ	30
135	001004	005767	000002		TST	LBLUP
136	001010	001407			REQ	38
137	001012	004767	000000		JSR	PC.FWINDO
138	001016	005767	010010		TST	RETR
139	001022	001002			BNE	35
140	001024	000167	000646		JMP	CNT99
141	001030	000167	000710	33:	JMP	OUT
142	001034	036727	000000	48:	CHP	BTYPE, 0
143	001042	001410			REQ	50
144	001044	012767	000000		MOV	10, BTYPE
145	001052	012767	000000		MOV	10, 17FT
146	001050	000167	000650		JMP	OUT
147	001064	026767	000002	50:	CHP	MINX, MAXX
148	001072	001736			REQ	35
149	001074	005767	000002		TST	LBLUP
150	001100	001783			REQ	30
151	001103	004767	000000		JSR	PC.TWINDO
152	001106	005767	010010		TST	RETR
153	001112	001402			REQ	993
154	001114	000167	000624		JMP	OUT
155	001120	000167	000552	990:	JMP	CNT99
156	001134	004767	000000	60:	JSR	PC.ERASE
157	001130	004767	000000		JSR	PC.HOME
158	001134	003067	000000		CLA	BTYPE
159	001140	012705	002234		MOV	10, 13
160	001144	004767	000000		JSR	PC.CHOUT
161	001150	003067	000000	78:	CLA	ICHRUF
162	001154	005767	000000	83:	TST	ICHRUF
163	001160	001775			REQ	83
164	001162	016767	000000	010723	ICHRUF, RETR2	
165	001170	02767	000000	010422	160, RETR2	
166	001176	003764			SUB	78
167	001200	036727	010022	000001	CHP	RETR2, 1
168	001206	003360			BGT	78
169	001210	000452			BNE	18
170	001212	026727	000000	000130	ICHRUF, 130	
171	001220	001034			CNT9	

;CHECK WINDOW REQUESTED

;CHECK XARIN REQUESTED (X)

172	001232	016767	000000	010010	MOV	ICRBUF, WRTA
173	001233	005767	000000		TST	LRLUP
174	001234	001410			BZQ	18
175	001235	026727	000000	000001	CHP	BTYPE, 01
176	001236	001004			BNE	18
177	001237	026767	000000	000004	CHP	MINX, MAXX
178	001238	001007			BNE	28
179	001239	012767	000001	000000	MOV	01, DTYPE
180	001240	005067	003082		CLR	IFFT
181	001241	000167	000450		JMP	OUT
182	001242	004767	000000	28:	JSR	PC, XANIN
183	001243	005767	010010		TST	WRTA
184	001244	001574			BZQ	CNT9
185	001245	000167	000432		JMP	OUT
186	001246	026727	000000	000101	CHP	ICRBUF, 0101
187	001247	001107			BNE	CNT10
188	001248	005067	000472		CLR	BSP+6
189	001249	004767	000000		JSR	ICRBUF
190	001250	004767	000000		JSR	PC, ERASE
191	001251	004767	000000		JSR	PC, HOME
192	001252	012703	002023		MOV	0ACR, R3
193	001253	004767	000000	10:	JSR	PC, CROUT
194	001254	005767	000000		TST	ICRBUF
195	001255	001775			BZQ	18
196	001256	026727	000000	000060	CHP	ICRBUF, 060
197	001257	002404			BLT	28
198	001258	026727	000000	000071	CHP	ICRBUF, 071
199	001259	003403			BLR	38
200	001260	005067	000000	28:	CLR	ICRBUF
201	001261	000762			BA	18
202	001262	003767	000406	33:	TST	BSP+6
203	001263	003026			BCT	48
204	001264	016767	000000	000376	MOV	ICRBUF, BSP+6
205	001265	016767	000000	010334	MOV	ICRBUF, INEPT
206	001266	162767	000000	010334	SUB	06, INEPT
207	001267	016703	010034		MOV	INEPT, R3
208	001268	070327	000012		MUL	010, R6
209	001269	010567	010034		MOV	R5, INEPT
210	001270	003067	000000		CLR	ICRBUF
211	001271	012703	003012		MOV	0BSP, R3
212	001272	004767	000000		JSR	PC, CROUT
213	001273	000731			BA	18
214	001274	016767	000000	000323	MOV	ICRBUF, BSP+6
215	001275	162767	000000	000000	SUB	06, ICRBUF
216	001276	066767	000000	010031	ADD	ICRBUF, INEPT
217	001277	012703	003012		MOV	0BSP, R3
218	001278	004767	000000		JSR	PC, CROUT
219	001279	003367	010031		BZQ	INEPT
220	001280	003003			BCE	58
221	001281	005037	010034		CLR	INEPT
222	001282	000167	000136	53:	JMP	RTXTRC
223	001283	026727	000000	000121	CHP	ICRBUF, 0124
224	001284	001004			BNE	CNT11
225	001285	004767	000000		JSR	PC, TC
226	001286	000167	000116		JMP	CNT9
227	001287	026727	000000	000126	CHP	ICRBUF, 0126
228	001288	001007			BNE	CNT12

;CHECK AVERAGING REQUESTED

;CHECK TRIGGER CONTROL REQUESTED (T)

;CHECK VIEW CONTROL REQUESTED

229 001570 004767 000000C	JSR	PC, VIEW	
230 001574 005767 010010'	TST	RENTN	
231 001600 001061	BNE	OUT	
232 001602 000167	JMP	CNT99	
233 001606 026727 000000' 000122	CMP	ICBUF, #122	:CHECK FOR 'R'
234 001614 001066	BNE	CNT13	
235 001616 004767	JSR	PC, REDUCER	
236 001622 004767	JSR	PC, DSETUP	
237 001626 000167 000044	JMP	NXTFNC	
238 001632 026727 000000' 000044	CMP	ICBUF, #44	:CHECK FOR 'S'
239 001640 001064	BNE	CNT14	
240 001642 004767	JSR	PC, DUMP	
241 001646 000167	JMP	NXTFNC	
242 001652 026727 000000' 000045	CMP	ICBUF, #45	:CHECK FOR %
243 001660 001066	BNE	CNT15	
244 001662 004767	JSR	PC, BEGXC	
245 001666 005067	CLR	ICBUF	
246 001672 009167	JMP	NXTFNC	
247 001676			
248			
249			
250 001676			
251 001676 005067	CLR	ICBUF	:ALLOW ENTRY NEXT FUNCTION
252 001702 004767 000000C	JSR	PC, ERASE	
253 001706 004767 000000C	JSR	PC, HOME	
254 001712 012703 003346'	MOV	#HLP, R5	
255 001716 004767 000000C	JSR	PC, CHOUT	
256 001722 012705 003263'	MOV	#NXP, R5	
257 001726 004767 000000C	JSR	PC, CHOUT	
258 001732 005767 000000'	TST	ICBUF	
259 001736 001775	BEQ	10	
260 001740 000167	JMP	CNT1	
261 001744 126727 000370' 000003	CMPB	TWMDT+6, #3	
262 001752 001407	BEQ	10	
263 001754 016767	MOV	STARTX, RSTART	
264 001762 016767 010014' 000144'	MOV	STOPX, RSTOP	
265 001770 000406	BR	29	
266 001772 016767 000342' 000142'	MOV	TWMD+<6*8>, RSTART	
267 002000 016767 000346' 000144'	MOV	TWMD+<6*8>, RSTOP	
268 002006 012603	MOV	(SP)+, R5	
269 002010 000207	RTS	PC	
270 006400			
271 005000			
272 000000			
273 000000			
274 002012 000001	.WORD	1, DSP+4, 1, 0	
275 002022	CHSTUP	ACR, WCR	
276 002030	CHTXT	<AVERAGING CONTROL REQUESTED>	
277 002074	CHTXT	<KEY IN 2 DIGIT NUMBER OF SCANS TO BE AVERAGED>	
278 002162	CHTXT	<'00' OR '01' INDICATE NO AVERAGING>	
279 002234	CHSTUP	WCR, DCR	
280 002242	CHTXT	<WINDOW CONTROL REQUESTED>	
281 002302	CHTXT	<SELECT WINDOW TYPE>	
282 002334	CHTXT	<0=FREQUENCY>	
283 002360	CHTXT	<1=TIME>	
284 002376	CHSTUP	DCR, TERM	

285	002404	CHTXT	<DISPLAY CONTROL INITIATED >
286	002446	CHTXT	<SELECT DISPLAY TYPE >
287	002502	CHTXT	<0=RAW DATA>
288	002524	CHTXT	<1=MAGNITUDE FREQUENCY SPECTRUM>
289	002572	CHTXT	<2=PHASE FREQUENCY SPECTRUM>
290	002634	CHTXT	<3=INVERSE FFT >
291	002662	CHTXT	<4=TOTAL SCAN>
292	002706	CHTXT	<5=SUB SCAN>
293	002730	CHSTUP	TERM,SCR
294	002736	CHSTUP	<MAIN SEQUENCE TERMINATING >
295	003000	CHSTUP	SCR,PSE
296	003006	CHTXT	<SCANNER CONTROL INITIATED >
297	003050	CHTXT	<SELECT INPUT SOURCE >
298	003104	CHTXT	<0=SIMULATED DATA>
299	003134	CHTXT	<1=REAL TIME DATA>
300	003164	CHTXT	<2=RECORDED DATA >
301	003214	CHTXT	<3=SAME SCAN >
302	003240	CHSTUP	PSE,NXF
303	003246	CHSTUP	<PAUSE >
304	003264	CHSTUP	NXF,HLP
305	003272	.WORD	C,R,L,F
306	003300	CHTXT	<SELECT NEXT CONTROL FUNCTION>
307	003302	CHSTUP	HLP,END
308	003346	CHTXT	<FUNCTIONS CURRENTLY AVAILABLE >
309	003354	CHTXT	<S=SCANNER CONTROL >
310	003422	CHTXT	<D=DISPLAY CONTROL >
311	003454	CHTXT	<A=SIGNAL AVERAGING>
312	003510	CHTXT	<Z=ZOOM CONTROL>
313	003566	CHTXT	<W=WINDOW CONTROL>
314	003616	CHTXT	<X=EXAMINE FFT >
315	003644	CHTXT	<T=TRIGGER CONTROL >
316	003676	CHTXT	<V=VIEW CONTROL>
317	003724	CHTXT	<R=DATA RECORDING>
318	003754	CHTXT	<E=EXIT>
319	003772	CHTXT	<P=PAUSE >
320	004012	CHTXT	<C=GO>
321	004026	.WORD	0
322	004026	.CSECT	TEKCON
323	000000	.WORD	0
324	000000	.WORD	0
325	000000	.CSECT	NTRCOM
326	000000	.WORD	0
327	000000	.BLKW	2051.
328	010010	.WORD	0
329	010012	.WORD	0
330	010014	.WORD	0
331	010014	.BLKW	2
332	010022	.WORD	0
333	010024	.WORD	0
334	010026	.WORD	0
335	010030	.WORD	0
336	010032	.WORD	0
337	010034	.WORD	0
338	010036	.WORD	0
339	000000	.CSECT	ISPCOM
340	000000	.WORD	0

341 000002	000000	MINX:	WORD	0
342 000004	000000	MAXX:	WORD	0
343			.BLKW	4
344 000016	000000	XLO:	WORD	0
345 000020	000000	XHI:	WORD	0
346 000022	000000	YLO:	WORD	0
347 000024	000000	YHI:	WORD	0
348			WORD	234
349 000262		TWND:	.BLKW	32.
350 000362		TURDY:	.BLKW	8.
351	000000.		.CSECT	CALCOM
352			.BLKW	513.
353 002002	000000	IFFT:	WORD	0
354 002004		FVND:	.BLKW	32.
355	000000.		.CSECT	SCNCOM
356 000000	000000	SOURCE:	WORD	0
357 000002	000000	SRCHTP:	WORD	0
358			.BLKW	12.
359			.BLKW	512.
360 002034	000000	STATUS:	WORD	0
361	000000.		.CSECT	RCDCOM
362			.BLKW	24.
363 000060	000001	WCHNUM:	WORD	1
364 000062	000002	RCINUM:	WORD	2
365			.BLKW	23.
366 000142	000000	RSTART:	WORD	0
367 000144	000000	RSTOP:	WORD	0
368	000001.		.END	

WRITE CHANNEL NUMBER  
READ CHANNEL NUMBER

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

## SYMBOL TABLE

[illegible]

C-140  
 RCDCOM 000146 007  
 - ERRORS DETECTED: 0  
 FREE CORE: 16081. WOUNDS

DK1:CNTRL/N:TTM/E:LC=CNTRL

[illegible]

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

58 000426 012767 000326 002040      MOV      #214.,IX1
59 000434 012767 000000 002034      MOV      #0,IY1
60 000442 000167 000240 000000      JNF      OUT
61 000446 026727 000000 000002      CNF      DTYPE,#2
62 000454 001041 000000 000000      BNE      DT3
63 000456 012767 000400 001754      MOV      #MDATA+2048.,ADATA      ;SET UP FOR SECOND HALF MDATA
64 000464 004767 001014 000012      JSR      PC,FSCL
65 000470 012767 000012 002020      MOV      #L7,ARBUF
66 000476 012767 000020 002016      MOV      #16.,N1
67 000504 012767 000200 001744      MOV      #12B.,IX
68 000512 012767 001250 001740      MOV      #680.,IY
69 000520 012767 001754 002010      MOV      #L3,ARBUF
70 000526 012767 000010 002006      MOV      #8.,N3
71 000534 012767 000000 001746      MOV      #0,IY2
72 000542 012767 000747 001742      MOV      #487.,IY2
73 000550 000167 177624 000000      VSF
74 000554 000167 000134 000000      JNF      OUT
75 000560 026727 000000 000003      CNF      DTYPE,#3
76 000566 001046 000000 000000      BNE      DT4N5
77 000570 012767 000002 001642      MOV      #MDATA,ADATA
78 000576 012767 000000 001640      MOV      #2048.,N
79 000604 016767 000013 000002      MOV      STARTX,NINX
80 000612 016767 000014 000004      MOV      STOPX,MAXX
81 000620 016767 000002 000000      MOV      IRNG,R2
82 000624 006302 000000 000000      ASL      R2
83 000626 016701 000004 000000      MOV      MAXX,R1
84 000632 070162 002142 000000      TSS(R2),R1
85 000636 010167 000004 000000      R1,MAXX
86 000642 016267 002116 000000      TDBB(R2),NDBX
87 000650 012767 002032 001640      MOV      #L3,ARBUF
88 000656 012767 000013 001636      MOV      #11.,N1
89 000664 012767 000370 001554      MOV      #248.,IX
90 000672 012767 001250 001550      MOV      #680.,IY
91 000700 000167 177250 000000      JNF      AVST
92 000704 004767 000000 000000      JSR      PC,SCNDSP
93 000710 000167 000352 000000      JNF      FIN2
94 000714 004767 000000 000000      JSR      PC,FRASE
95 000720 012765 002346 000000      MOV      #PCAL1,R5
96 000724 004767 000000 000000      JSR      PC,IPLLOT
97 000730 012705 002514 000000      MOV      #HCAL1,R5
98 000734 004767 000000 000000      JSR      PC,PRTH
99 000740 012705 002354 000000      MOV      #PCAL2,R5
100 000744 004767 000000 000000      JSR      PC,IPLLOT
101 000750 012705 002524 000000      MOV      #HCAL2,R5
102 000754 004767 000000 000000      JSR      PC,PRTH
103 000760 012705 002500 000000      MOV      #PCAL3,R5
104 000764 004767 000000 000000      JSR      PC,IPLLOT
105 000770 012705 002534 000000      MOV      #VCAL1,R5
106 000774 004767 000000 000000      JSR      PC,PRTH
107 000780 004767 000000 000000      JSR      PC,ALPHA
108 000784 012767 001543 001444      MOV      #567.,IX
109 000790 012767 001344 001440      MOV      #740.,IY
110 000800 012765 002346 000000      MOV      #PCAL1,R5
111 000804 004767 000000 000000      JSR      PC,IPLLOT
112 000810 016701 000000 000000      MOV      IRNG,R4
113 000814 006304 000000 000000      ASL      R4
114 000816 006304 000000 000000      ASL      R4

```

;SELECT PLOT LABELS FOR PHASE SHIFT  
;SET UP TO PLOT TOTAL MDATA BUFFER  
;SELECT PLOT LABELS FO INVERSE FFT  
;PLOT TOTAL OR SUB SCAN  
;PLOT TITLE  
;PLOT XLABEL  
;PLOT YLABEL  
;RESTORE CHARACTER SIZE  
;PLOT RANCE AND DELAY

115	001040	016467	002166	001334	MOV	ARNG(R4),TRM
116	001046	016467	002170	001330	MOV	ARNG+2(R4),TRM+2
117	001054	016704	000000		MOV	IUTS,R4
118	001060	116467	001710	001320	MOV	TD(R4),TRM+4
119	001066	012705	002374		MOV	#RWMSG,R5
120	001072	004767	000000		JSR	PC,CHOUT
121	001076	012767	001323	001334	MOV	#20.,1Y
122	001104	012705	002446		MOV	#PCAL1,R5
123	001110	004767	000000		JSR	PC,IPLLOT
124	001114	116767	000032	001300	MOV	TDLY1,DDH
125	001122	152767	000060	001272	BISB	#60,DDH
126	001130	116767	000060	001255	MOV	TDLY2,DDH+1
127	001136	152767	000060	001257	BISB	#60,DDH+1
128	001144	116767	000012	001232	MOV	TDLY3,DDH+2
129	001152	152767	000060	001244	BISB	#60,DDH+2
130	001160	012705	002414		MOV	#DELMSG,R5
131	001164	004767	000060		JSR	PC,CHOUT
132	001170	005000			CLR	R0
133	001172	016701	010034		MOV	IREPT,R1
134	001176	005201			INC	R1
135	001200	071027	000012		DIV	#10.,R0
136	001204	062700	000060		ADD	#60,R0
137	001210	062701	000060		AND	#60,R1
138	001214	110067	001046		MOV	R0,AKNT
139	001220	110167	001043		MOV	R1,AKNT+1
140	001224	005767	000000		TST	DTYPE
141	001230	001456			BEQ	STST
142	001232	005767	010024		TST	FVACT
143	001236	001413			BEQ	ITST
144	001240	162767	000024	001212	SUB	#20.,1Y
145	001246	012705	002446		MOV	#PCAL1,R5
146	001252	004767	000000		JSR	PC,IPLLOT
147	001256	012705	002270		MOV	#FWMSG,R5
148	001262	004767	000000		JSR	PC,CHOUT
149	001266	005767	010025		TST	IACT
150	001272	001413			BEQ	XTST
151	001274	162767	000024	001156	SUB	#20.,1Y
152	001302	012705	002446		MOV	#PCAL1,R5
153	001306	004767	000000		JSR	PC,IPLLOT
154	001312	012705	002312		MOV	#MSG,R5
155	001316	004767	000000		JSR	PC,CHOUT
156	001322	005767	010030		TST	XACT
157	001326	001417			BEQ	STST
158	001330	026727	000000	000003	CMP	DTYPE,#3
159	001336	001413			BEQ	STST
160	001340	162767	000024	001112	SUB	#20.,1Y
161	001346	012705	002446		MOV	#PCAL1,R5
162	001352	004767	000000		JSR	PC,IPLLOT
163	001356	012705	002356		MOV	#MSG,R5
164	001362	004767	000000		JSR	PC,CHOUT
165	001366	005767	010032		TST	SSACT
166	001372	001413			BEQ	ATST
167	001374	162767	000024	001056	SUB	#20.,1Y
168	001402	012705	002446		MOV	#PCAL1,R5
169	001406	004767	000000		JSR	PC,IPLLOT
170	001412	012705	002336		MOV	#MSG,R5
171	001416	004767	000000		JSR	PC,CHOUT

;PLACE REPEAT COUNT IN BUFFER

;PLOT WARNINGS AS REQUIRED

```

172 001422 005767 010034' ATST:
173 001426 001413
174 001430 162767
175 001436 012705 000024 001022
176 001442 004767 000000C
177 001446 012705 002246'
178 001452 004767 000000C
179 001456 012705 002436'
180 001462 004767 000000C
181 001466
182 001502 000207
183 001504 006767
184 001512 006767
185 001520 012705 004000
186 001524 005467 010026'
187 001530 072367 010026'
188 001534 072367 010026'
189 001540 003467 010026'
190 001544 016702 010014'
191 001550 166702 010012'
192 001554 005202
193 001556 010200
194 001560 070037 010016'
195 001564 071003
196 001566 010067 000002'
197 001572 010200
198 001574 070037 010020'
199 001600 071003
200 001602 010067 000004'
201 001606 016767 010020' 000630
202 001614 166767 010016' 000623
203 001622 003267 000516
204 001636 016702 000002'
205 001634 016700 000004'
207 001640 070062 002072'
208 001644 071027 003000
209 001650 010067 000004'
210 001654 016700 000002'
211 001660 070062 002072'
212 001664 071027 004000
213 001670 010067 000002'
214 001674 016267
215 001702 000207 000256'
216 001704 115 113 040 FB:
217 001710 000 153 TB:
218 001714 000
219 001726
220 001744
221 001754
222 001764
223 001774
224 002012
225 002032
226 002046 000002 000003 000003 FDBD:

IREPT
FIN
#20.:IY
PGAL1,R5
PC,IPLOT
#AESC,R5
PC,CHOUT
#FCALL,R5
PC,FPILOT
543210
PC
FSTART,ADATA
FSTART,ADATA
#2040.,R3
IACI
IACI,R3
IACI,R3
IACI
STOPX,R2
STARTX,R2
R2
R2,R0
FSTART,R0
R3,R0
R3,MINX
R2,R0
FSTOP,R0
R3,R0
R3,MAXX
FSTOP,R
FSTART,N
N
IRNG,R2
R2
MAXX,R0
FSS(R2),R0
#256.,R0
R0,MAXX
MINX,R0
FSS(R2),R0
#256.,R0
R0,MINX
FDBD(R2),NDBX
PC
113,113,40,0
165,153,40,0
< AMPLITUDE> .1
< FREQUENCY HZ> .1
< SECONDS> .1
< DEGREES> .1
< RAW DATA> .1
< MAGNITUDE FFT> .1
< PHASE SHIFT FFT> .1
< INVERSE FFT> .1
2,3,3,3,3,4,4,4,4,5,5,5

```

;PLOT DATA AND GRID

; INTERNAL SUBROUTINE TO CALCULATE X SCALE FOR FREQUENCY

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

270	000000	000000	WORD	0
271	000002	000000	WORD	0
272			BLKV	12.
273	000034	000000	BLKV	2048.
274			CSECT	ATPARA
275	000000	000000	WORD	0
276	000002	000000	WORD	0
277	000004	000000	WORD	0
278	000006	000000	WORD	0
279	000010	000000	WORD	0
280	000012	000000	WORD	0
281		000000	CSECT	DISCOM
282	000000	000000	WORD	0
283	000002	000000	WORD	0
284	000004	000000	WORD	0
285			BLKV	84.
286	000256	000000	WORD	0
287	000260	000000	WORD	0
288		000000	CSECT	NTRCOM
289	000000	000000	WORD	0
290	000002	000000	BLKV	2050.
291	010006	000000	WORD	0
292	010010	000000	WORD	0
293	010012	000000	WORD	0
294	010014	000000	WORD	0
295	010016	000000	WORD	0
296	010020	000000	WORD	0
297	010022	000000	WORD	0
298	010024	000000	WORD	0
299	010026	000000	WORD	0
300	010030	000000	WORD	0
301	010032	000000	WORD	0
302	010034	000000	WORD	0
303		000001	END	

ADATA	002440R	002516R	002526R	AKUT	002266R	002536R	004
ALGO	002246R	002166R	001422R	AVDUF	002536R	002536R	005
CHOUT	= ***** G	002432R	002414R	DISPLA	000000R	000000R	002
DT1	000262R	000145R	000560R	DT4NS	000704R	000704R	004
ERASE	= ***** G	001704R	002436R	FDD	002046R	001456R	005
FIN2	001456R	00024R	002270R	FSS	002072R	010016R	002
FSTOP	010020R	000034R	002270R	HCAL1	002514R	002534R	004
IAC	010025R	010034R	000000R	INSG	002514R	002534R	004
IPLOT	= ***** G	002474R	000002R	ITST	001266R	000000R	005
IX	002456R	001714R	002510R	IY	002460R	000000R	004
IY2	002512R	001714R	002510R	L3	001744R	001744R	004
L5	001764R	001774R	002012R	L3	002032R	002536R	004
ND	010006R	000002R	000012	L3	002532R	002536R	004
ND8Y	000260R	000002R	000012	N	002532R	002536R	004
PCAL3	002542R	000714R	000007	PCAL1	002532R	002536R	005
RCHSC	002374R	000714R	000007	PCAL2	002532R	002536R	005
R4	000004	000714R	000007	PCAL3	002532R	002536R	005
SSACT	010032R	000714R	000007	PCAL4	002532R	002536R	005
TDRD	002116R	000714R	000007	PCAL5	002532R	002536R	005
TSS	002142R	000002R	000007	PCAL6	002532R	002536R	005
XTST	001322R	002534R	000007	PCAL7	002532R	002536R	005
. ABS.	000000			PCAL8	002532R	002536R	005
IBUF	002544			PCAL9	002532R	002536R	005
ATPAA	010034			PCAL10	002532R	002536R	005
D3PCON	000014			PCAL11	002532R	002536R	005
ETPCON	000262			PCAL12	002532R	002536R	005
ETPCON	010036			PCAL13	002532R	002536R	005
ERRORS DETECTED:	0			PCAL14	002532R	002536R	005
FREE CODE:	16480. WORDS			PCAL15	002532R	002536R	005

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

1 .TITLE BSETUP
2 .CLOBL ERASE,HOIE,CHOUT,BSETUP,FRANIN
3 .CLOBL POPEN,PCLOSE,CRLF
4 .MCALL SAVE,URGAVE,CHTXT,CHSTUP,SUPTXT,...V2....CLOSE...RECEVE
5 ..V2..
6 .RECEVE
7 .SAVE
8 BSETUP:
9 DS0:
10 000000 000000
11 000000 000000
12 000000 000000
13 000000 000000
14 000000 000000
15 000000 000000
16 000000 000000
17 000000 000000
18 000000 000000
19 000000 000000
20 000000 000000
21 000000 000000
22 000000 000000
23 000000 000000
24 000000 000000
25 000000 000000
26 000000 000000
27 000000 000000
28 000000 000000
29 000000 000000
30 000000 000000
31 000000 000000
32 000000 000000
33 000000 000000
34 000000 000000
35 000000 000000
36 000000 000000
37 000000 000000
38 000000 000000
39 000000 000000
40 000000 000000
41 000000 000000
42 000000 000000
43 000000 000000
44 000000 000000
45 000000 000000
46 000000 000000
47 000000 000000
48 000000 000000
49 000000 000000
50 000000 000000
51 000000 000000
52 000000 000000
53 000000 000000
54 000000 000000
55 000000 000000
56 000000 000000

; IF > 0 A FILE IS ACTIVE

; ACTIVE FILE

;GET FILELOCK POINTER
; ADD 8 TO GET ADDRESS OF ASCII
; MOVE TO FILENAME ADDRESS

; WRITE FILENAME
; SEND CRLF

;RECORDING ON R,FF)
;CHECK RECORDING ON
; IF ON GO TO 18
; WRITE 'FF'<CRLF>

; WRITE 'N'<CRLF>

; WRITE OPTION DISPLAY

; WAIT FOR CHAR

; IF <60 TRY AGAIN

; IF INPUT > 60 AGAIN

; TURN RECORDING ON

;TURN RECORDING OFF

;TURN RECORDING OFF
;CLOSE WRITE CHANNEL
;DISCARD ACTIVE FILE

```

```

57 000300 004767 000000: JSR
58 000304 005067 000000: CLR
59 000310 003767 000000: JSR
60 000314 003767 000000: TST
61 000320 001418 000000: BEQ
62 000322 012705 001144: MOV
63 000326 004767 000000: JSR
64 000332 003067 000000: CLR
65 000336 003767 000000: TST
66 000342 001775 000000: BEQ
67 000344 026727 000000: JMP
68 000352 001352 000000: BNE
69 000354 012767 001111: MOV
70 000358 000000: .CLOSE
71 000374 004767 000000: JSR
72 000400 005767 000000: TST
73 000404 001605 000000: BEQ
74 000406 012705 001246: MOV
75 000412 004767 000000: JSR
76 000416 003067 000000: CLR
77 000422 005767 000000: TST
78 000426 001775 000000: BEQ
79 000430 000167 177363: JMP
80 000434 005067 000000: CLR
81 000440 000000: UNSAVE
82 000442 000207 01234: RTS
83 000454 000000: PC
84 000510 000000: DISC1,DISC2,<NO ACTIVE FILE>
85 000514 000000: SUPTXT,DISC3,<ACTIVE FILE IS>
86 000570 000000: SUPTXT,DISC3,DISC4,<RECORDING IS 0>
87 000610 000000: SUPTXT,DISC4,DISC5,<FF>
88 000630 000000: SUPTXT,DISC5,DISC6,<N>
89 000636 000000: CRESTUP,DISC6,DISC7
90 000676 000000: CHITXT,<SELECT RECORDING OPTION>
91 000732 000000: CHITXT,<0-TURN RECORDING ON>
92 000766 000000: CHITXT,<1-TURN RECORDING OFF>
93 001030 000000: CHITXT,<2-CLOSE ACTIVE FILE AND TURN RECORDING OFF>
94 001100 000000: CHITXT,<3-OPEN NEW FILE>
95 001144 000000: CHITXT,<4-RETURN TO CONTROL DISPLAY>
96 001246 000000: SUPTXT,DISC7,DISC8,<FILE ALREADY EXISTS: DO YOU WISH TO DELETE IT (Y/N)>
97 001254 000000: CRESTUP,DISC8,DISC9
98 001322 000000: CHITXT,<INSUFFICIENT SPACE TO OPEN FILE>
99 001414 000000: CHITXT,<DELETE ONE OR MORE FILES ON BK1 OR INSERT NEW DISK>
100 001434 000000: CHITXT,<PRESS RETURN TO PROCEED>
101 001434 000001: .WORD 1
102 001434 000000: .WORD 0
103 001436 000000: .CSECT TELCON
104 001436 000000: .WORD 0
105 000000: .CSECT RECORD
106 000000: .WORD 0
107 000000: .WORD 0
108 000002 000000: .WORD 0
109 000004 015327: .RAB50 /BK1/
110 000014 000012: .BLKW 3
111 000016 000016: .WORD 10
112 000016 000016: .BLKW 10
113 000030 013327 073512 076600: .RAB50 /BK1SCRTCBAT/

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

000036	014474				
114 000040	000012				
115 000042	123				
000043	124	103	123		
000050	056	103	110		
000053	124	104	101		
115 000054	000000				
117 000056	000000				
118 000060	000001				
119 000062	000002				
120 000064	000000				
121 000066	000000				
122 000070	000000				
123	000001				

DEL:	.WORD	10	
DTBUF:	.ASCII	/SCRATCH.DAT/	

FSTAT:	.WORD	0
FSTAT1:	.WORD	0
WCHURN:	.WORD	1
RCHEUN:	.WORD	2
CHURN:	.WORD	0
BLCHUN:	.WORD	0
BLCNT:	.WORD	0
	.END	

; BLOCK COUNT

```

BLKENT 000070R 003 BLKNUM 000056R 003 CHNUM 000064R 003
DBL 000040R 003 DFLT 000030R 003 DMSG1 000454R 003
DL3C3 000544R 003 DMSG2 00010R 003 DMSG6 000630R 003
DL3C3 001246R 003 DMSG4 00070R 003 DMSG7 001144R 003
DS1 00050R 003 DMSG9 001434R 003 DSJ 000220R 003
DS2 000110R 003 DS3 000160R 003 DS4 000232R 003
DS5 000256R 003 DS7 00030R 003 DS5 000250R 003
FBL 000014R 003 FBPNTN 00002R 003 DS75 000304R 003
FNAHIN= ***** G FBL 000016R 003 FBL 000304R 003
HONE = ***** G FBL 000016R 003 FBL 000304R 003
PC =X000007 FBL 000016R 003 FBL 000304R 003
R1 =X000001 FBL 000016R 003 FBL 000304R 003
SP =X000006 FBL 000016R 003 FBL 000304R 003
. AIR. CG0000 000 FBL 000304R 003
TEKCOH 00140 001 FBL 000304R 003
RCHCOH 00002 002 FBL 000304R 003
RCHCOH 00072 003 FBL 000304R 003
FBL003 DETECTED: 0
FIRE CORE: 16279. WORDS

```

. DCL: DSETUP/N: TTH/E: LC= DSETUP

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



58	000302	000002		CLR	R3
59	000304	012705	000412	MOV	*ECHO,10
60	000310	000067	000000	CLR	ICIBUF
61	000314	000767	000000	TST	ICIBUF
62	000320	001775		BEQ	20
63	000322	016703	000000	MOV	ICIBUF,R3
64	000326	162703	000060	SUB	*60,R3
65	000332	002766		HLT	18
66	000334	020327	000067	CHP	R3,*7
67	000340	003363		BGT	18
68	000342	116767	000000	MOV	ICIBUF,OUTCHR
69	000350	004767	000000	JSR	PC,CHOUT
70	000354	022327	000015	ASH	*13,R3
71	000360	073227	000003	ASHC	*3,R3
72	000364	077427		SOB	R4,18
73	000366	005067	000000	CLR	ICIBUF
74	000372	005701		TST	R1
75	000374	001244		BNE	LINE0
76	000376	004767	000000	JSR	PC,CHUP
77	000402	010201		MOV	R2,R1
78	000404	005067	000000	CLR	ICIBUF
79	000410	000732		BR	SCNEX
80	000412	000001	000416	.WORD	1,ECHO+4
81	000416	000001		.WORD	1
82	000420	000001		.BYTE	0
83	000421	000		CHSTUP	DMSC2,EDMSC2
84	000430			CHTXT	<ENTER OCTAL ADDRESSES>
85	000466			EDMSC2:	100.
86	000466	000002		TTBUF:	2
87	000632	000640		R2ACAL:	VALUE
88	000634	000000		AOADR:	0
89	000636	000000		VALUE:	0
90	000640	000000		STADR:	SOURCE,SBUF,TBUF,STATUS
91	000642	000000	000634		1FFT,KOSINE,DTYPE,MD,1EXIT
92	000650	002034		.WORD	ATDLY1,IUTS,IBUF,ION,OUTBUF
93	000652	002002	000000	.WORD	SZ2,TBUF-2,STATUS-2,ARIVED
94	000660	010006	000000	.WORD	FMD+14,1FFT-2,WCHAR
95	000664	000000	000034	.WORD	THRESH,MD-2,BPOL,CRNG,IBUF+4096,-2
96	000672	000000	000166	.WORD	OUTBUF-2,OUTBUF+2054,-2
97	000676	000032	001032	.WORD	DMSC,EDMSC
98	000704	002164		.WORD	<DUMP OPTIONS:>
99	000706	002122	000414	.WORD	<A-SBUF>
100	000714	010040	010004	.WORD	<B-SBUF>
101	000722	000030	010032	.WORD	<C-TBUF>
102	000726	000164	000172	.WORD	<D-SCNOM AFTER TBUF>
103	000732			.WORD	<E-CALCON W/O KOSINE>
104	000740			.WORD	<F-KOSINE>
105	000766			.WORD	<G-B3FCON>
106	001022			.WORD	<H-NTRCON>
107	001036			.WORD	<I-1EXIT 8 MDATA>
108	001112			.WORD	<J-ATPATA>
109	001146			.WORD	
110	001206			.WORD	
111	001226			.WORD	
112	001256			.WORD	

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

110 001276
111 001326
112 001344
113 001400
114 001420
115 001456
116 000000
117 000000
118 000000
119 000032
120 000034
121 001034
122 002034
123 000000
124 002164
125 000000
126 000000
127 002002
128 002004
129 002104
130 000000
131 000000
132 000002
133 010006
134 000000
135 010040
136 000000
137 000000
138 000000
139 000414
140 000000
141 000000
142 000000
143 000116
144 000000
145
146
147
148
149 000000
150 000000
151 000000
152 000030
153 000034
154 000000
155 000000
156 000000
157 000166
158 000000
159 000000
160 000001

```

EDISC: <K-IBUF W/O IBUF>  
 CHTXT <L-IBUF>  
 CHTXT <N-RCBCH W/O OUTBUF>  
 CHTXT <N-OUTBUF>  
 CHTXT <O-ENTER LIMITS OF DUPP>

SOURCE: .CSECT SCHCON  
 .WORD 0  
 .BLKW 12.  
 SZ2: .WORD 0  
 SBUF: .BLKW 256.  
 TBUF: .BLKW 256.  
 STATUS: .WORD 0  
 .BLKW 43.  
 ARIVED: .WORD 0  
 .CSECT CALCON  
 .BLKW 513.  
 KOSINE: .WORD 0  
 IFFT: .BLKW 32.  
 FWD: .BLKW 8.  
 FND: .CSECT NTRCON  
 .WORD 0  
 .BLKW 2050.  
 ND: .WORD 0  
 .BLKW 12.  
 THRESH: .WORD 0  
 .CSECT DSPCON  
 .WORD 0  
 .BLKW 133.  
 VCHAR: .WORD 0  
 .CSECT ATPARA  
 .ATDLY1: 0  
 .BLKW 38.  
 BPOL: 0  
 ;  
 ;  
 ;  
 ;  
 COMCON IBUF  
 ;  
 ;  
 ;  
 ;  
 IUTS: .CSECT IBUF  
 .BLKW 11.  
 CRNG: 0,0  
 IBUF: .BLKW 2348.  
 .CSECT RCBCH  
 .WORD 0  
 .BLKW 58.  
 OUTBUF: .BLKW 2034.  
 .CSECT TEKCON  
 .WORD 0  
 ICHBUF: .END

SYMBOL TABLE

ADADR	000600R	ARRIVED	002164R	002	ATDLY1	000000R	006	BPOL	000116R	006	B2ACAL	000632R	
B2AO	= ***** C	CHOUT	= ***** C	005	CHLF	= ***** C		CRNG	000030R		IMSC	000732R	
DIEG2	000422R	DTYPE	000000R		DUMP	000030R		ECHO	000412R		EDMSG	001456R	003
ENDSC2	000466R	ENDADR	000676R		ERASE	= ***** C		FMD	002104R		FWD	002004R	004
GETNUM	000254R	HONE	= ***** C		IBUF	000034R	007	ICIBUF	000106R		IEKIT	000000R	
IFFT	002022R	IUTS	000000R	007	KOSINE	000000R	003	LINE0	000106R		LINE1	000124R	
LINE2	000170R	HD	016006R	004	NDATA	000002R	004	LINE0	000106R		NUM1	= 000026	010
OUT	000236R	OUTBUF	000166R	010	OUTCHR	000420R		NUM	= 000001		RON	000000R	
R3	= 0000000	R1	= 0000001		R2	= 0000002		PC	= 0000007		R4	= 0000004	
R5	= 0000003	SBUF	000034R	002	SCNDX	000276R		R3	= 0000003		SP	= 0000006	004
STADR	000642R	STATUS	002034R	002	SZ23	000032R		SOURCE	000000R		THRESH	010040R	
TBUF	000466R	VALUE	000640R		WCHAR	000414R	002	TBUF	001034R	002			
.ABS.	000000			005									
SCNCON	001456												
CALCON	002166												
NTNCON	002124												
DSPCON	010042												
ATPARA	000416												
IBUF	000120												
RCDCOM	00034												
TELCON	004174												
ERRORS DETECTED:	0												
FREE CORE:	16656. WORDS												

.DK1: DUMP/N: TTN/E: LC=DUMP

LINE	ADDRESS	OPERATION	COMMENT
1	000000	FCLOSE	IF FILE BLOCK POINTER = 0-
2	000000	FCLOSE	IF THERE IS NO ACTIVE FILE
3	000000	FCLOSE	CLOSE THE CHANNEL & RETURN
4	000000	FCLOSE	
5	000000	FCLOSE	
6	000000	FCLOSE	
7	000000	FCLOSE	
8	000000	FCLOSE	
9	000000	FCLOSE	
10	000000	FCLOSE	
11	000000	FCLOSE	
12	000000	FCLOSE	
13	000000	FCLOSE	
14	000000	FCLOSE	
15	000000	FCLOSE	
16	000000	FCLOSE	
17	000000	FCLOSE	
18	000000	FCLOSE	
19	000000	FCLOSE	
20	000000	FCLOSE	
21	000000	FCLOSE	
22	000000	FCLOSE	
23	000000	FCLOSE	
24	000000	FCLOSE	
25	000000	FCLOSE	
26	000000	FCLOSE	
27	000000	FCLOSE	
28	000000	FCLOSE	
29	000000	FCLOSE	
30	000000	FCLOSE	
31	000000	FCLOSE	
32	000000	FCLOSE	
33	000000	FCLOSE	
34	000000	FCLOSE	
35	000000	FCLOSE	
36	000000	FCLOSE	
37	000000	FCLOSE	
38	000000	FCLOSE	
39	000000	FCLOSE	
40	000000	FCLOSE	
41	000000	FCLOSE	
42	000000	FCLOSE	
43	000000	FCLOSE	
44	000000	FCLOSE	
45	000000	FCLOSE	
46	000000	FCLOSE	
47	000000	FCLOSE	
48	000000	FCLOSE	
49	000000	FCLOSE	
50	000000	FCLOSE	
51	000000	FCLOSE	
52	000000	FCLOSE	
53	000000	FCLOSE	

FCLOSE RT-11 MACRO VMS2-12 21-NOV-79 PAGE 1+

SYMBOL TABLE

BH11 000124R 002 BLKNUM 000066R 002 BLOW1 000130R 002  
 FCLOSE 00000000 FCLOSE 00000000 002 OUT 000134R 002  
 R0 =X0000000 R1 =X0000001 002 R2 WCALL 000170R 002  
 R3 =X0000003 SP =X0000006 002  
 ...V2 = 0000001 000  
 . ABS. 0000000 001  
 R0DCON 000174 001  
 C-3166 002

ERRORS DETECTED: 0  
 FREE CORE: 16812. WORDS

.BK1:FCLOSE/H:TTM/E:LC=FCLOSE

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR

```

1  .TITLE FNAMIN
2  .GLOBL CHOUT, FNAMIN, FFIN, GRUF
3  .KCALL SAVE, UNSAVE, CHTXT, CHSTUP, SUPTXT, .RECDEF
4  .REGDEF
5      FNAMIN: SAVE 012345
6      MOV #FNSC1, R5
7      JSR PC, CHOUT
8      TSTB FBUFF
9      BEQ F1
10     MOV #FNSC2, R5
11     JSR PC, CHOUT
12     MOV #FNSC3, R5
13     JSR PC, CHOUT
14     JSR PC, GRUF
15     CLR ICHBUF
16     TST ICHBUF
17     BEQ F2
18     MOV ICHBUF, R0
19     SUB #60, R0
20     BLT F1
21     CNP R9, #2
22     BGT F1
23     BNE F2
24     TSTB FBUFF
25     BEQ F1
26     MOV #RUF, FBPNTR
27     BR FLOOK
28     TST R0
29     BNE F3
30     MOV #DPLT, FBPNTR
31     BR FLOOK
32     MOV #FNSC3, R5
33     JSR PC, CHOUT
34     CLR R1
35     CLR R2
36     CLR R3
37     MOV #ECHO, R5
38     CLR ICHBUF
39     TST ICHBUF
40     BEQ F2
41     CNP FBUFF, #56
42     BNE F3
43     TST R3
44     BNE F3
45     TST R1
46     BEQ F3
47     CNP R1, #6
48     BGE F3
49     MOV #40, FBUFF(R1)
50     INC R1
51     BR F2
52     MOV #1, R3
53     BR F3
54     CNP R1, #6
55     BNE F3
56     TST R3
57     TST R3

```

: DONT ACCEPT <60  
 : IGNORE INPUT >2  
 : CHECK FOR NO OLD FILENAME  
 : IF NO OLDFILENAME REJECT #2  
 : SET FILEBLOCK POINTER TO OLD FILENAME  
 : CHECK FOR ZERO INPUT  
 : IF NOR 0 (IS 1) GO TO F3  
 : SET FILEBLOCK POINTER TO DEFAULT NAME  
 : R1 IS BUFFER POINTER  
 : R2 IS EXTENSION COUNTER  
 : R3 IS "IN EXTENSION" FLAG  
 : R5 IS CALL POINTER FOR CHOUT  
 : CHECKFOR " "  
 : CHECK FOR " " PREVIOUSLY RECEIVED  
 : IF " " FIRST CHAR, IGNORE IT  
 : SET "IN EXTENSION" FLAG  
 : IF 6TH CHAR NOT " " AND EXTENSION NOT BEGUN  
 : START OVER

58	000256	001732		REQ	F3	
59	000260	026727		CMF	ICHBUF, #101	;CHECK FOR "A"
60	000260	026737	318:	BLT	13	
61	000266	002737		CMF	ICHBUF, #132	;CHECK FOR "Z"
62	000270	026727		BGT	19	
63	000276	003333		MOV	ICHBUF, FBUP(R1)	
64	000300	116761	48:	INC	R1	
65	000310	016767		MOV	ICHBUF, KCHBUF	
66	000316	004767		JSR	PC, CHOUT	
67	000322	040302		ADD	R3, R2	;CHECK FOR END OF EXTENSION
68	000324	029227		CMF	R2, #4	
69	000330	002716		BLT	19	
70	000332	004767		JSR	PC, CRLF	
71	000336	012702		MOV	#FBUP, R2	;R2 IS ASCII
72	000342	012703		MOV	#RBUF+2, R3	;R3 IS RAD50
73	000346	004767		JSR	PC, A2R50	;CONVERT FIRST 3 CHARS
74	000352	012703		MOV	#RBUF+4, R3	
75	000356	004767		JSR	PC, A2R50	;SKIP PERIOD
76	000362	003202		INC	R2	
77	000364	012703		MOV	#RBUF+6, R3	;CONVERT EXTENSION
78	000370	004767		JSR	PC, A2R50	
79	000374	012767		MOV	#RBUF, FBPNTR	
80	000402	012705		MOV	#FCALL, R5	
81	000412	004767	FLOOK:	JSR	PC, FFIND	;LOOK UP FILE
82	000426	000207		UNSAVE	543210	
83	000430	005005		RTS	PC	
84	000436	012704	A2R50:	CLR	R5	;R3 HAS RETURN VALUE ADDRESS
85	000440	070327		MOV	#3, R4	
86	000450	122227	18:	MUL	#50, R5	
87	000454	001405		CMF	(R2)+, -40	
88	000456	005302		DEC	R2	
89	000460	112200		MOV	(R2)+, R0	
90	000462	060033		ADD	R0, R5	
91	000464	162705		SUB	#100, R5	
92	000470	077413		SQB	R4, 10	
93	000472	010513	20:	MOV	R5, (R3)	
94	000474	000207		UNSAVE	045	
95	000502	000207		RTS	PC	
96	000504	100		CMF	FHSC1, FHSC2	
97	000512	101		CMF	<SELECT FILE OPTION>	
98	000514	102		CMF	<0-DEFAULT FILE TO "SCRATCH.DAT">	
99	000516	103		CMF	<1-ENTER FILE NAME>	
100	000518	104		CMF	FHSC2, FHSC3	
101	000520	105		CMF	<2-USE PREVIOUS FILENAME OF >, 1	
102	000522	106		CMF	FHSC3, FHSC4	
103	000524	107		CMF	<ENTER FILENAME>	
104	000526	000001		CMF	.WORD 1, FBL	
105	000528	000001		CMF	.WORD 1, ECHO+4, 1	
106	000530	000001		CMF	.WORD 0	
107	000532	000002		CMF	.WORD 2, RBUF, FSTAT	
108	000534	000002		CMF	.CSECT RCDCOM	
109	000536	000000		CMF	.WORD 0	
110	000538	000000		CMF	.WORD 0	
111	000540	000000		CMF	.WORD 0	
112	000542	000000		CMF	.WORD 0	
113	000544	000000		CMF	.WORD 0	
114	000546	000000		CMF	.WORD 0	

**C-60**

[illegible]

. AFS. 060000 000  
 000764 001  
 000816 002  
 000802 003  
 ERRORS DETECTED: 0  
 FILE CORE: 16770. WORDS

**,DKI:FHAMH/N:TTM/E:LC=FHAMH**

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR





FFLOT RT-11 NACHO VMO2-12 31-NOV-79 PAGE 1+

DEK	000404R	000406R	DEY	000408R	DTTE	000410R	002	FFLOT	000412R
IP	000374R	000376R	IX	000378R	IXR	000380R	002	1Y	000382R
NAXX	000004R	000006R	MINX	000008R	MINY	000010R	002	R1	000012R
FAXIS	000004R	000006R	PCALL	000008R	PLDOP	000010R	002	R2	000012R
R1	0000001	0000002	R3	0000003	R4	0000004	002	R5	0000005
SP	0000006	0000007	R5	0000008	XSXT	000010R	002	R6	000012R
YH1	0000004R	0000005R	XSXT	0000006R	Y0	000010R	002	R7	000012R
AMS	0000000	0000001	Y0	0000002R		000010R	002		
BSNOM	0000006	0000007							
NUMMS DETECTED:	0								
FILE CORE:	17061. WORDS								

.DC1:FFLOT/N:TTN/E:LC-FFLOT



**C-66**

```

115 000646 070002 MUL R2,R0
116 000650 071027 DIV #550.,R0
117 000654 010067 MOV R0,1Y
118 000660 026767 CHF 1X,FSTART
119 000666 003003 BGT OK
120 000670 016767 MOV #00016',R0
121 000676 026727 CHF #000406
122 000704 001453 BEQ 000450 OK:
123 000706 005767 TST 010024'
124 000712 001657 BEQ
125 000714 012702 MOV 002004'
126 000720 016201 MOV #00010
127 000722 012703 MOV 003720
128 000726 012767 CHF 000322
129 000734 031262 BEQ 000004
130 000740 001420 MOV
131 000742 011200 MOV
132 000744 012704 MOV 000002
133 000750 166700 SOB 000330
134 000754 002001 BGE
135 000756 005400 NEG
136 000760 020067 CMP 000272
137 000764 002003 BGE
138 000766 010201 MOV
139 000770 010067 MOV 000262
140 000774 016200 MOV 000004
141 001000 077415 SOB
142 001002 062702 ADD 000010
143 001006 077326 SOB
144 001010 003011 CLR
145 001012 003061 CLR
146 001016 003367 DEC
147 001022 012767 MOV 000230
148 001034 000167 JIP
149 001034 026727 CHF APNT:
150 001042 001603 BEQ
151 001044 026727 CHF 000210
152 001052 001010 BNE 177777
153 001054 016767 MOV 000224
154 001062 016767 MOV 000220
155 001070 000167 JMP 177356
156 001074 035267 INC 010024'
157 001100 012703 MOV 000510
158 001104 012702 MOV 002004'
159 001110 012704 MOV 002101'
160 001114 021262 CMP 000604
161 001120 001016 BNE
162 001122 016712 MOV 000132
163 001126 016762 MOV 000130
164 001134 016762 MOV 000144
165 001142 016762 MOV 000140
166 001150 016714 MOV 010005'
167 001154 000406 BR
168 001156 002702 ADD 000010
169 001162 005724 TST
170 001164 077325 SOB
171 001166 162702 SUB 000010

```

;CHECK FOR LOW VALUE  
 ;DELETE WINDOW  
 ;SEARCH CLOSEST X  
 ;CLEAR CLOSEST WINDOW  
 ;CHECK MAX  
 ;CHECK FIRST OR SECOND POINT  
 ;SAVE FIRST POINT  
 ;PLACE POINTS IN BUFFER

R2,R0  
 #550.,R0  
 R0,1Y  
 1X,FSTART  
 OK  
 FSTART,1X  
 1ALPHA,#100  
 APNT  
 FVACT  
 ENTR  
 #FVND,R2  
 R2,R1  
 #B.,R3  
 #2000.,DX  
 (R2),4(R2)  
 50  
 (R2),R0  
 #2,R4  
 1X,R0  
 30  
 R0,DX  
 40  
 R2,R1  
 R0,DX  
 4(R2),R0  
 R4,20  
 #B.,R2  
 R3,10  
 (R1)  
 4(R1)  
 FVACT  
 #-1,LX  
 OUT  
 FVACT,#B.  
 ENTR  
 LX,#-1  
 ;CHECK FIRST OR SECOND POINT  
 PNT2  
 1X,LX  
 1Y,LY  
 ENTR  
 FVACT  
 #B.,R3  
 #FVND,R2  
 #FVND,R4  
 (R2),4(R2)  
 20  
 LX,(R2)  
 LY,2(R2)  
 1X,4(R2)  
 1Y,6(R2)  
 MD,(R4)  
 30  
 #B.,R2  
 (R4)+  
 R3,10  
 #B.,R2 ;OOPS

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



223 000000 000000  
 224 000010 000000  
 225 000012 000000  
 226 000014 000000  
 227 000016 000000  
 228 000020 000000  
 229 000022 000000  
 230 000024 000000  
 231 000001

NINY:  
 MAXY:  
 X0:  
 Y0:  
 XLO:  
 XHI:  
 YLO:  
 YHI:

.WORD  
 .WORD  
 .WORD  
 .WORD  
 .WORD  
 .WORD  
 .WORD  
 .WORD  
 .END

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR



ENCLOSURE RT-11 MACRO VMD-12 21-NOV-79 PAGE 1

[illegible]

IENCDE 00000000	PC	=X0000067	R0	=X0000000	R1	=X0000001
R2 =X0000003	R4	=X0000004	R5	=X0000005	SP	=X0000006
. ABS. 0000000 000						
000110 001						

ERRORS DETECTED: 0  
 FREE CORE: 17178. WORDS

.DK1: IENCDE/H: TTY/E: LC- IENCDE

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

1	LSIINT	RT-11	MACRO	VME2-12	21-NOV-79	PAGE 1
2						
3						
4	000000	002166	005267	000000		
5	000000					
6	000004					
7	000012	167740	012702	000000		
8	000016	000040	043712	000040		
9	000022	000004	012700	000004		
10	000036	002131	012701	002131		
11	000032		003712			
12	000034		002376			
13	000036	167744	013731	000001		
14	000043	000001	053712			
15	000046		003712			
16	000050		002776			
17	000052	000001	043713			
18	000056		077013			
19	000060	000040	053712			
20	000064	002131	116700			
21	000070	002135	116701			
22	000074		005200			
23	000076	000003	072027			
24	000102		060001			
25	000104	000156	116100			
26	000110	000226	005270			
27	000114		005700			
28	000116		001011			
29	000120	002050	016767			
30	000126	002140	016767			
31	000134	002142	016767			
32	000142					
33	000150	002166	005067			
34	000154		000002			
35	000156	006	006			
36	000164	006	006			
37	000174	002	012			
38	000204	004	012			
39	000206	004	012			
40	000214	000	012			
41	000216	000	012			
42	000224	002	012			
43	000230	002	012			
44	000234	002	012			
45	000242	002	012			
46	000244	002	012			
47	000246	002	012			
48	000248	002	012			
49	000250	002	012			
50	000252	002	012			
51	000254	002	012			
52	000256	002	012			
53	000258	002	012			
54	000260	002	012			
55	000262	002	012			
56	000264	002	012			
57	000266	002	012			
58	000268	002	012			
59	000270	002	012			
60	000272	002	012			
61	000274	002	012			
62	000276	002	012			
63	000278	002	012			
64	000280	002	012			
65	000282	002	012			
66	000284	002	012			
67	000286	002	012			
68	000288	002	012			
69	000290	002	012			
70	000292	002	012			
71	000294	002	012			
72	000296	002	012			
73	000298	002	012			
74	000300	002	012			
75	000302	002	012			
76	000304	002	012			
77	000306	002	012			
78	000308	002	012			
79	000310	002	012			
80	000312	002	012			
81	000314	002	012			
82	000316	002	012			
83	000318	002	012			
84	000320	002	012			
85	000322	002	012			
86	000324	002	012			
87	000326	002	012			
88	000328	002	012			
89	000330	002	012			
90	000332	002	012			
91	000334	002	012			
92	000336	002	012			
93	000338	002	012			
94	000340	002	012			
95	000342	002	012			
96	000344	002	012			
97	000346	002	012			
98	000348	002	012			
99	000350	002	012			
100	000352	002	012			
101	000354	002	012			
102	000356	002	012			
103	000358	002	012			
104	000360	002	012			
105	000362	002	012			
106	000364	002	012			
107	000366	002	012			
108	000368	002	012			
109	000370	002	012			
110	000372	002	012			
111	000374	002	012			
112	000376	002	012			
113	000378	002	012			
114	000380	002	012			
115	000382	002	012			
116	000384	002	012			
117	000386	002	012			
118	000388	002	012			
119	000390	002	012			
120	000392	002	012			
121	000394	002	012			
122	000396	002	012			
123	000398	002	012			
124	000400	002	012			
125	000402	002	012			
126	000404	002	012			
127	000406	002	012			
128	000408	002	012			
129	000410	002	012			
130	000412	002	012			
131	000414	002	012			
132	000416	002	012			
133	000418	002	012			
134	000420	002	012			
135	000422	002	012			
136	000424	002	012			
137	000426	002	012			
138	000428	002	012			
139	000430	002	012			
140	000432	002	012			
141	000434	002	012			
142	000436	002	012			
143	000438	002	012			
144	000440	002	012			
145	000442	002	012			
146	000444	002	012			
147	000446	002	012			
148	000448	002	012			
149	000450	002	012			
150	000452	002	012			
151	000454	002	012			
152	000456	002	012			
153	000458	002	012			
154	000460	002	012			
155	000462	002	012			
156	000464	002	012			
157	000466	002	012			
158	000468	002	012			
159	000470	002	012			
160	000472	002	012			
161	000474	002	012			
162	000476	002	012			
163	000478	002	012			
164	000480	002	012			
165	000482	002	012			
166	000484	002	012			
167	000486	002	012			
168	000488	002	012			
169	000490	002	012			
170	000492	002	012			
171	000494	002	012			
172	000496	002	012			
173	000498	002	012			
174	000500	002	012			
175	000502	002	012			
176	000504	002	012			
177	000506	002	012			
178	000508	002	012			
179	000510	002	012			
180	000512	002	012			
181	000514	002	012			
182	000516	002	012			
183	000518	002	012			
184	000520	002	012			
185	000522	002	012			
186	000524	002	012			
187	000526	002	012			
188	000528	002	012			
189	000530	002	012			
190	000532	002	012			
191	000534	002	012			
192	000536	002	012			
193	000538	002	012			
194	000540	002	012			
195	000542	002	012			
196	000544	002	012			
197	000546	002	012			
198	000548	002	012			
199	000550	002	012			
200	000552	002	012			
201	000554	002	012			

```

;COMMAND TO LSI-11
;COMMAND DATA
      @ ;ENCOUNTERS RECEIVED FLAG
      @ ;SCAN FINISHED FLAG
      @ ;SCAN AXIS
      @ ;NUMBER OF POINTS ON SCAN AXIS
      @ ;MINIMUM INCREMENT IN X-Y PLANE
      @ ;DATA FROM LSI-11
      @ ;ERROR FLAG
      @ ;COMMUNICATIONS IN PROGRESS

```

LSINT RT-11 MACRO V08-12 21-NOV-79 PAGE 14

SYMBOL TABLE

ARRIVED	002164R	003	AXIS	002126R	003	CMDAT	002100R	002	CRAND	002076R	002	CONIP	002166R	002
BEGIN	002132R	002	ERROR	002162R	002	FLCS	002226R	002	FLCHD	000156R	002	LSIBAT	002134R	002
LSINT	000000R	002	LS100T	002132R	002	RCOR	002050R	002	RCORV	002122R	002	NUL	000244R	002
NUMPWT	002130R	002	PC	000000R	002	R0	000000R	002	R1	000000R	002	R2	000000R	002
R3	000000R	002	R4	000000R	002	R5	000000R	002	R6	000000R	002	R7	000000R	002
SOURCE	000000R	002	SP	000000R	002	SPCHT	000000R	002	SNIP	000000R	002	STATUS	002034R	002
SX1	000000R	002	SX2	000000R	002	SY1	000000R	002	SY2	000000R	002	SZ1	000000R	002
SZ2	000000R	002	TBUF	000000R	002	TPCHT	000000R	002	TX1	000000R	002	TX2	000000R	002
TV1	000000R	002	TY2	000000R	002	TZ1	000000R	002	TZ2	000000R	002	YDIR	000000R	002
XLIN	002066R	002	XLIN2	002072R	002	XPWT	002042R	002	YDIR	002040R	002	YLIN	002070R	002
YLIN2	002074R	002	YPWT	002044R	002	ZPWT	002046R	002						
YLS	000000R	000												
SCREEN	002170	002												
DETECT	000000	003												
ERRORS DETECTED:	0													
FILE CORE:	10972.40003													

LSINT RT-11 MACRO V08-12 21-NOV-79 PAGE 14

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



53	010036	000000	REPLY: .WORD *
59		000000	.CSECT IBUF
60		010034	.+4124
61		000000	.END NKS

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

AVCR = ***** C	BEGIN = ***** G	ICALC = ***** G	004	CNTCAL 00016200	003
CNTL = ***** C	CONDISP = ***** G	ICHBUF 0000000R	004	EXIT 0000000R	003
NMS 0000000C	HW1 000024R	PACK = ***** G	005	PC 00000007	
RDT = ***** C	RECORD = ***** G	REPINT 010036R		R0 00000000	
R1 = 0000001	R2 = 0000002	R4 00000004		R5 00000005	
SCAN = ***** G	SCAND = ***** G	SP 00000006		STATUS 0020034R	002
TEKIN = ***** C	UNPACK = ***** G				
. ABS. 0000000					
000206					
002036					
002002					
000002					
010040					
010034					
ERRORS DETECTED: 0					
FREE CORE: 17138. WORDS					
.DK1:NMS/N:TTM/E:LC=NMS					

```

1 000000
2 000014
3 000020
4 000024
5 000030
6 000034
7 000040
8 000044
9 000050
10 000054
11 000060
12 000064
13 000070
14 000074
15 000080
16 000084
17 000090
18 000094
19 000100
20 000104
21 000110
22 000114
23 000120
24 000124
25 000130
26 000134
27 000140
28 000144
29 000150
30 000154
31 000160
32 000164
33 000170
34 000174
35 000180
36 000184
37 000190
38 000194
39 000200
40 000204
41 000210
42 000214
43 000220
44 000224
45 000230
46 000234
47 000240
48 000244
49 000250
50 000254
51 000260
52 000264
53 000270
54 000274
55 000280
56 000284
57 000290

; TITLE PAXIS
; GLOBL PAXIS, PSCALE, ERASE, IPLOT, CROUT
; MCALL SAVE, UNSAVE, REDEF
; REDEF
; CALL PAXIS
INPUT: MINX, MAXX, MINY, MAXY FROM DSPCON
USES X0, Y0, XLO, XHI, YLO, YHI, DX, DY
XLNC, XTLBL, YLNC, YTBL IN DSPCON
PLOTS FIXED AXIS WITH LABELED TIC MARKS
SAVE 012345
; PAXIS:
MOV #SCALL, R5
MOV #SCALL+2, R1
MOV #MINX, (R1)+
MOV #MAXX, (R1)+
MOV #XLO, (R1)+
MOV #XHI, (R1)+
MOV #DX, (R1)+
MOV #XTLBL, (R1)+
MOV #XLNC, (R1)+
MOV #Y0, (R1)+
MOV #ALX, (R1)+
MOV #NDBX, (R1)
JSR PC, PSCALE
MOV #SCALL, R5
MOV #SCALL+2, R1
MOV #MINY, (R1)+
MOV #MAXY, (R1)+
MOV #YLO, (R1)+
MOV #YHI, (R1)+
MOV #DY, (R1)+
MOV #YTLBL, (R1)+
MOV #YLNC, (R1)+
MOV #Y0, (R1)+
MOV #ALY, (R1)+
MOV #HDBY, (R1)
JSR PC, PSCALE
IP
MOV #100., IX
MOV #620., IY
MOV #PCALL, R5
JSR PC, IPLOT
MOV #70., IY
INC IP
JSR PC, IPLOT
MOV #1000., IX
JSR PC, IPLOT
MOV #44., IX
MOV #20., IY
MOV #XLNC, R3
CLR R4
MOV #XTLBL, R2
IP
MOV #52., R0
MOV #50., R1
MOV #R0, IX
MOV #R1, IY
MOV #PCALL, R5

; SET X SCALE IF NEEDED
; SET Y SCALE IF NEEDED
; DRAW AXIS LINES
; SET UP TO PLOT X TIC LABELS
; X VALUE START
; Y VALUE START

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

58	000000C	004767	000000C	JSR	PC, IPLOT
59	000026	012267	000262	MOV	(R2)+, CBUF
60	000332	012267	000262	MOV	(R2)+, CBUF+2
61	000336	012267	000266	MOV	(R2)+, CBUF+4
62	000342	012705	000606	MOV	#CHCALL, R5
63	000346	004767	000000C	JSR	PC, CHOUT
64	000352	066767	000244	ADD	TX, IX
65	000360	066767	000240	ADD	TY, IY
66	000366	012705	000530	MOV	#FCALL, R5
67	000372	004767	000000C	JSR	PC, IPLOT
68	000376	012705	000566	MOV	#XCALL, R5
69	000402	005704		TST	R4
70	000404	001402		BEQ	NX
71	000406	012705	000576	MOV	#DCALL, R5
72	000412	004767	000000C	JSR	PC, CHOUT
73	000416	066300		ADD	R3, R0
74	000420	060401		ADD	R4, R1
75	000422	020027	001750	CMP	R0, #1000.
76	000426	020127		BGT	NXT
77	000430	003724	001154	CMP	R1, #620.
78	000434	005703		BLE	NL
79	000436	005703		TST	R3
80	000440	001421		BEQ	OUT
81	000442	012767	000113	MOV	#75., TX
82	000450	012767	177771	MOV	#-7., TY
83	000456	005003		CLR	R3
84	000460	016704	000144	MOV	YLNC, R4
85	000464	012702	000146	MOV	#YTLBL, R2
86	000470	012700	000031	MOV	#25., R0
87	000474	012701	000106	MOV	#70., R1
88	000480	000167	177602	JNP	NL
89	000304			UNSAVE	543210
90	000320	000207		RTS	PC
91	000322	000012	000000	.WORD	10., 0, 0, 0, 0, 0, 0, 0, 0, 0
92	000330	000000	000000	SCALL:	
93	000336	000000	000000	PBALL:	3, IX, IY, IP
94	000342	000000		IX:	0
95	000346	000000		IY:	0
96	000356	000001	000001	XCALL:	1, XCALL+4, 1
97	000374	041	040	DCALL:	/1 /
98	000376	000001	000001	DCALL:	1, DCALL+4, 1
99	000604	035	040	CHCALL:	/- /
100	000606	000001	000006	CHCALL:	1, CHCALL+4, 6
101	000614	000000	000000	CBUF:	0, 0, 0
102	000622	000000		TX:	0
103	000624	000000		TY:	0
104	000626	001604		ALX:	900.
105	000630	001046		ALY:	550.
106		000000		.CSECT	DSPCOM
107	000600	000000		.WORD	0
108	000602	000000		.WORD	0
109	000604	000000		.WORD	0
110	000606	000000		.WORD	0

21-NOV-79 PAGE 1+

```

MAXY: 0
XG: 0
YO: 0
XLO: 0
XHI: 0
YLO: 0
YHI: 0
DX: 0
DY: 0
XLNC: 0
XTLBL: 36.
YLNC: 0
YTLBL: 36.
NDX: 0
NDBY: 0
END

```

**C-81**

SYMBOL TABLE

ALX	000636R	ALY	000630R	CRUP	000614R	CRCALL	000606R	CRUT = ***** C	
DCALL	000376R	DTYPE	000000R	DX	000026R	DY	000030R	ERASE = ***** C	
IP	000564R	IFLOT = ***** C		IX	000560R	IY	000562R	HAXX	000004R
NAXY	000010R	MINX	000002R	MINY	000006R	NDBX	000256R	HDSY	000260R
NL	000306R	NX	000412R	NXT	000436R	OUT	000504R	PAXIS	000000R
PC	=X000007	PCALL	000500R	PSCALE= ***** G		R0	=X000000	R1	=X000001
R2	=X000002	R3	=X000003	R4	=X000004	R5	=X000005	SCALL	000022R
SP	=X000006	TX	000622R	TY	000624R	XCALL	000566R	XH1	000020R
XLNC	000032R	XL0	000016R	XTLBL	000034R	X0	000012R	YH1	000024R
YLN0	000144R	YLO	000022R	YTLBL	000146R	X0	000014R		
. ARS.	000000					Y0			
	000032								
INPCOM	000032								
ERRORS DETECTED:	0								
FREE CORE:	16935. WORDS								

.DK1:PAXIS/H:TTM/E:LC=PAXIS

1	0000000	005767	000412'	PLTW:	TST	.TITLE	PLTW		
2	0000000	001001			BNE	.GLOBL	PLTW, IPLOT, CROUT, HOME		
3	0000004	000207			RTS	.RECALL	SAVE, UNSAVE, .RECDER		
4	0000010			P0:	SAVE	.RECDEF			
5	0000022	012703	000500'		MOV		WTP		:CHECK WINDOW TYPE
6	0000026	005003			CLR		P0		:IF TYPE ZERO (INACTIVE), RETURN
7	0000030	016700	000402'		MOV		PC		
8	0000034	166700	010012'		MOV		01235		
9	0000040	016702	000003'		SUB		ENDAT1, R5		
10	0000044	166702	000002'		MOV		R3		
11	0000050	070002	010014'		SUB		XL, R0		:SET UP DATA STACK
12	0000052	016702	010012'		MOV		STARTX, R0		:SECOND PASS FLAG
13	0000056	166702	010012'		SUB		MAXX, R2		:GET X LOW
14	0000062	071002	000016'		MOV		MINX, R2		:CONVERT X TO SCREEN COORDINATES
15	0000064	066700	000014'		MOV		R2, R0		
16	0000070	070027	001004'		SUB		STOPX, R2		
17	0000074	016702	000020'		DIV		STARTX, R2		
18	0000078	016702	000016'		ADD		R2, R0		
19	0000084	066700	000014'		ADD		MINX, R0		
20	0000090	070027	001004'		MOV		900, R0		
21	0000094	016702	000020'		MOV		XH1, R2		
22	0000100	166702	000016'		SUB		XL0, R2		
23	0000104	071002	000014'		DIV		R2, R0		
24	0000106	066700	000012'		ADD		100, R0		
25	0000112	066700	000012'		ADD		X0, R0		
26	0000116	010045			MOV		R0, -(R5)		:CHECK FOR SECOND PASS
27	0000120	005703			TST		R3		
28	0000122	001004			BNE		P2		:SET SECOND PASS
29	0000124	005203			INC		R3		:GET HIGH X
30	0000126	016700			MOV		XM1, R0		:GO CONVERT X HI
31	0000132	000740	000406'		BR		P1		:SECOND PASS FLAG
32	0000134	005003		P2:	CLR		R3		:GET Y LOW
33	0000136	016700	000404'		MOV		YML, R0		:CONVERT Y TO SCREEN COORDINATES
34	0000142	070027	001046'		MOV		550, R0		
35	0000146	016702	000024'		MOV		YH1, R2		
36	0000152	166702	000022'		SUB		YLO, R2		
37	0000156	071002	000106'		DIV		R2, R0		
38	0000160	066700	000014'		ADD		70, R0		
39	0000164	066700	000014'		ADD		Y0, R0		
40	0000170	010045			MOV		R0, -(R5)		
41	0000172	005703			TST		R3		
42	0000174	001004			INC		P3		
43	0000176	005203			MOV		R3		
44	0000180	016700	000410'		MOV		YMH, R0		
45	0000184	000706			BR		P25		:CHECK FOR WINDOW OUTSIDE DISPLAY
46	0000186	026707	010012'	P3:	CMF		STARTX, XWL		
47	0000188	003403			BLE		10		
48	0000190	016707	010012'		MOV		STARTX, XWL		
49	0000192	026707	010014'	13:	CMF		STOPX, XWL		
50	0000194	026707	010014'		BCE		20		
51	0000196	026707	010014'		MOV		STOPX, XWL		
52	0000198	026707	000022'	25:	CMF		YLO, YWL		
53	0000200	003403			BLE		30		
54	0000202	016707	000022'		MOV		YLO, YWL		
55	0000204	026707	000024'	39:	CMF		YH1, YWL		
56	0000206	002033			BCE		P4		
57	0000208	016707	000024'		MOV		YH1, YWL		



```

113 000016 000000
114 000020 000000
115 000022 000000
116 000024 000000
117
118 000026
119 000028
120 000030
121 000032
122 000034
123 000036
124 000038
125 000040
126 000042
127 000044
128 000046
129 000048
130 000050
131 000052
132 000054
133 000056
134 000058
135 000060
136 000062
137 000064
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SYMBOL TABLE

CHOUT = ***** C	BTYP	000000R	003	FSTART	010016R	002	FSTOP	010020R	002	FVACT	010024R	002
HONE = ***** C	IACT	010026R	002	IDCALL	000434R	002	IEXIT	000000R	002	IP	000460R	003
IPLOT = ***** C	IREPT	010034R	002	IX	000454R	002	IY	000456R	003	MAXX	000004R	003
MAXY = 000010R	ND	010006R	002	MDATA	000002R	002	MINX	000002R	003	MINY	000006R	003
PC = 0000007	PCALL	000444R	002	PLTW	000000R	002	PNT	000372R	003	P0	000010R	003
P1 = 000000R	P2	000134R	002	P25	000142R	002	P3	000206R	002	P4	000276R	003
P5 = 000376R	P6	000420R	002	RENT	010010R	002	RENT2	010022R	002	R0	0000000	003
R1 = 0000001	R2	0000002	002	R3	0000003	002	R4	0000004	002	R5	0000005	003
SP = 0000006	SSACT	010032R	002	STARTX	010012R	002	STOPX	010014R	002	TWID	000262R	003
TWIDT = 0000002R	WCHAR	000414R	003	WDAT	000476R	003	WDAT1	000500R	003	WID	000442R	003
WTP = 000412R	WTPC	000462R	003	XACT	010030R	002	XH1	000020R	003	XLO	000016R	003
XWTH = 000376R	XWH	000406R	003	XWL	000402R	003	X0	000012R	003	YBCTH	000400R	003
YH1 = 000024R	YLO	000022R	003	YWH	000410R	003	YWL	000404R	003	Y0	000014R	003

. ABS. 000000 000  
 NTRCON 000500 001  
 DSPCON 010036 002  
 DSPCON 000416 003  
 ERRORS DETECTED: 0  
 FREE CORE: 10928. WORDS

. DK1:PLTW/N:TTM/E:LC=PLTW

```

1  TITLE PSCALE, IENCODE
2  .GLOBL PSCALE(MIN,MAX,LO,H1,D,TLEL,LNC,0,AL,R2)
3  CALL PSCALE(MIN,MAX,LO,H1,D,TLEL,LNC,0,AL,R2)
4  HIN,MAX=DATA RANGE INPUT
5  H1,LO=AXIS RANGE OUTPUT
6  D-TIC SPACING IN DATA COORDINATES
7  TLEL=ARRAY 3 WORD ASCII TIC LABELS OUTPUT
8  LNC,0-TIC INCREMENT,ORIGIN OUTPUT
9  AL=AXIS LENGTH
10 D2=DIGITS BEHIND DECIMAL FLAG
11 .NCALL SAVE,UNSAVE,.RECEDEF
12 PSCALE: 012345
13 MOV R3,R4
14 MOV R2(R4),R0
15 SUB R6(R4),R0
16 BLT RCX
17 CMP R0,R6(R4)
18 BGT RCX
19 MOV R0,R6(R4)
20 SUB R0,R4)
21 BLT RCX
22 CMP R0,R6(R4)
23 BGT RCX
24 JMP OUT
25 MOV R4(R4),R1
26 SUB R2(R4),R1
27 CLR R0
28 DIV R0,R0
29 CMP R0,R2
30 BLT R0
31 BGT R0
32 TST R1
33 MOV R0,R2
34 MOV R0,R2
35 SXT R0
36 DIV R0,R0
37 MUL R0,R0
38 CMP R0,R0
39 BLE R0
40 SUB R0,R0
41 MOV R0,R0
42 SXT R0
43 DIV R0,R0
44 MUL R0,R0
45 CMP R0,R0
46 DCE R0
47 ADD R0,R0
48 MOV R0,R0
49 CMP R0,R0
50 BNE R0
51 ADD R0,R0
52 MOV R0,R0
53 CMP R0,R0
54 BNE R0
55 ADD R0,R0
56 MOV R0,R0
57 CMP R0,R0

```

;CHECK IF NEED TO CALCULATE AXIS VALUES  
 ;CALCULATE AXIS VALUES  
 ;SELECT MATABL VALUE .CE. SPAN/10  
 ;CALCULATE LO AND H1  
 ;SET AXIS TIC LABELS

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS PO

**C-88**

PSCALE RT-11 MACRO VHC2-12 21-NOV-79 PAGE 1+

```

ICALL 000476R
OUT    000424R
R1     =X000001
SP     =X000006
. AB3. 000000 000
        000000 001
ERROR: DETECTED: 0
FUEL CORR: 17066. W0R03

IERCDE= ***** G
PC      =X000007
R2      =%000002

KAB3S   000302R
PSCALE  0000G0R0
R3       =X000003

NSTABL   000442R
PCX      000062R
R4       =X000004

RVALUE   000004R
R0       =X000000
R5       =X000000

DK1:PSCALE/N:TTH/E:LC=PSCALE

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1 2
2 3
3 4
4 000000
5
6 000000 126727 000371' 000004
7 000006 001401
8 000010 000207
9 000012
10 000020 016700 000352'
11 000024 016701 000356'
12 000030 160001
13 000032 006300
14 000034 062700 000034'
15 000040 016702 000360'
16 000044 022002
17 000046 062032
18 000050 010200 177776
19 000054 077105
20 000056 000207
21 000058 000000'
22 000060 000262'
23
24 000362
25 000362 000000'
26
27 000034 000001'
28
29

```

.TITLE RDT  
 .CLOBL RDT  
 .MCALL SAVE, UNSAVE, .RECEP  
 .RECEP  
 DATA THRESHOLDING ROUTINE  
 TANDT<7,>4 ;CHECK FOR TYPE FOUR WINDOW IN LAST WINDOW SLOT  
 RDT2 ;IF THRESHOLDING WINDOW ACTIVE, CONTINUE  
 PC  
 012  
 TANDT<7+8,>,R0 ;GET OFFSET FOR BEGINING OF T WINDOW IN DATA  
 TANDT<7+8,>+4,R1 ;GET OFFSET FOR END OF DATA  
 R0,R1 ;GET LENGTH OF WINDOW  
 R0 ;GET BYTE OFFSET  
 1BUF,R0 ;GET ADDRESS OF BEGINING OF DATA  
 TANDT<7+8,>+6,R2 ;GET Y HIGH (THRESHOLD VALUE)  
 (R0)+,R2  
 28  
 R2,-2(R0)  
 R1,R1  
 210  
 PC  
 .DSPECN  
 .CSECT  
 .BLKW 32.  
 .BLKB 8.  
 .CSECT 1BUF  
 .BLKW 14.  
 .BLKW 2048.  
 .END

1

### STUDY TABLE

IBUF	000034R	003
R1	=X000001	
SP	=X000006	
. AL3.	0000000	000
DEPOH	0000066	001
IBUF	000012	012
IBUF	000014	013

IBUF ERRORS DETECTED: 0

FREE CORE: 17129. WORDS

**.DKI:RDT/N:TTM/E:LC=HDT**

PC = X2000097  
P2 = X2000002  
TMD 000262R

TWT 00000000  
 00000000  
 TWT 0003620

0000122  
0000122  
0000122

[illegible]

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

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.TITLE RECORD3

RECORD3: DATA COMPRESSION AND RECORDING

COMPRESSION ALGORITHM -

This compression algorithm has the effect of reducing the data to a string of plotter commands. Each command tells the plotter where to go relative to its current position. This string of commands is preceded by a header containing the initial position.

Each command is one byte long and consists of two fields. The command field specifies the use of the count field. The first three bits are the command field, the remaining five bits are the count field.

1-1-1-1-1-1-1-1-1-1  
Cmd. Count

When the count is zero, the next byte in the data contains the true count.

There is a three bit command field in each command. Thus there are eight possible commands. Six of these are used.

COMMAND	MASK	DESCRIPTION
0	000	END OF RECORD MARK
1	040	ADVANCE STRAIGHT AHEAD
2	100	GO UP ONE AND AHEAD
3	140	GO DOWN ONE AND AHEAD
4	200	GO STRAIGHT UP
5	240	GO STRAIGHT DOWN
6	300	UNUSED
7	340	UNUSED

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566</
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```

1  .NLST TTH
2  .GLOBL FCLOSE, RECORD, WRTEBUF, WPH
3  .MCALL .RECDEF
4  .RECDEF
5  .MACRO
6  BCHECK A
7  R1, BUFEND
8  A
9  PC, IWRBUF
10 .ENDM
11 RECORD: TST 000000
12 BNE 001001
13 RTS 000004
14 TST 000006
15 BEQ 000007
16 MOV 000010
17 ADD 000014
18 ADD 000016
19 ADD 000022
20 ADD 000026
21 ADD 000030
22 ADD 000034
23 MOV 000040
24 000044
25 000046
26 000050
27 000052
28 000054
29 000056
30 000060
31 000064
32 000066
33 000070
34 000072
35 000074
36 000076
37 000078
38 000080
39 000082
40 000084
41 000086
42 000088
43 000090
44 000092
45 000094
46 000096
47 000098
48 000100
49 000102
50 000104
51 000106
52 000108
53 000110
54 000112
55 000114
56 000116
57 000118

```

;CHECK OUTBUF FULL  
 ;CHECK RECORDING ON  
 ;CHECK THRESHOLD EXCEEDED  
 ;GET WINDOW OFFSET  
 ;ADD ADDRESS OF DATA BUFFER  
 ;R4 IS STOP ADDRESS  
 ;R0 IS START ADDRESS  
 ;R4, STPADR  
 ;SAVE DATA POINT AND INSERT STOPPER IN DATA  
 ;GET DATA AT STOP ADDRESS  
 ;SAVE DATA POINT AFTER STOP ADDRESS  
 ;INSURE DIFFERENT VALUE  
 ;INSERT STOPPER IN DATA  
 ;STOPPER INSURES THAT COMPRESSION WON'T  
 GO PAST END OF RECORDING WINDOW.  
 JSR PC, WPH  
 MOV OBPTR, R1  
 ;WRITE POINT HEADER  
 ;GET OUTBUF POINTER  
 REGISTER USAGE:  
 R0 - POINTER TO RAW DATA  
 R1 - POINTER TO COMPRESSED DATA  
 R2 - COUNT OF REPEATED VALUES  
 R3 - OLD VALUE / DELTA VALUE  
 R4 - NEW VALUE  
 R5 - COMPRESSION COMMAND  
 MOV (R0)+, R3  
 MOV (R0)+, R4  
 MOV R0, R2  
 CMPB (R0)+, R4  
 BEQ 19  
 SUB R0, R2  
 NEG R2  
 DEC R0  
 ;START VALUE  
 ;GET NEW VALUE  
 ;SAVE INITIAL ADDRESS  
 ;GET COUNT OF REPEATED VALUES  
 ;ADJUST POINTER TO POINT TO NEXT NEW VALUE  
 REGISTER STATUS:  
 R0 - POINTS TO NEXT NEW DATA VALUE  
 R1 - POINTS TO NEXT ADDRESS IN OUTBUF  
 R2 - HAS COUNT OF EQUAL VALUES  
 R3 - HAS OLD VALUE  
 R4 - HAS NEW VALUE

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

Address	Operation	Comments
005204	INC R4	GET ADDRESS AFTER STOP
005370	MOV R4, (R4)	RESTORE DATA POINT
115 000372	MOV R1, OBPNTR	UPDATE OUTBUF POINTER
116 000374	TST STATUS	CHECK FOR END OF SCAN
117 000376	REQ 15	CHECK FOR NEAR END OF FILE
118 000400	MOV BLKCNT, R2	IF NOT, RETURN
119 000404	SUB BLKNUM, R2	TURN RECORDING OFF
120 000406	CHP R2, #4	CLOSE AND DISCARD ACTIVE FILE
121 000412	BGT OUT	WRITE SCAN TRAILER
122 000416	CLR R0N	
123 000422	JSR PC, FCLOSE	
124 000424	RTS PC	
125 000430	JSR PC, NST	
126 000434	RTS PC	
127 000436	OUT: 15:	
128 000442	RTS	
129 129		
130 130		
131 131		
132 132		
133 133		
134 000444	INRBUF: MOV R3, -(SP)	SAVE R3
135 000446	MOV R1, OBPNTR	UPDATE POINTER
136 000452	MOV #WCALL, R5	GET ARGUMENT LIST
137 000456	JSR PC, WRTBUF	WRITE OUTBUF TO DISK
138 000462	MOV OBPNTR, R1	GET NEW POINTER
139 000466	MOV (SP), R5	RESTORE R5
140 000470	RTS	RETURN TO RECORD
141 141		
142 142		
143 143		
144 000472	WST - WRITE SCAN TRAILER TO OUTBUF	
145 000476	BIT #1, R1	CHECK FOR ODD ADDRESS
146 000500	REQ 15	INGERT ZERO BYTE
147 000502	CLRB (R1)	INGERT ZERO BYTE
148 000514	BCHECK 25	INGERT ZERO BYTE
149 000520	MOV #2, (R1)	INGERT ZERO BYTE
150 000522	RTS PC	INGERT ZERO BYTE
151 000526	WCALL: .WORD 1, 0	INGERT ZERO BYTE
152 000532	STPADR: .WORD 0	INGERT ZERO BYTE
153 000536	.CSECT DSPCOM	INGERT ZERO BYTE
154 000542	.BLKB 262	INGERT ZERO BYTE
155 000548	.BLKW 32	INGERT ZERO BYTE
156 000554	.BLKB 8	INGERT ZERO BYTE
157 000560	.BLKW 16	INGERT ZERO BYTE
158 000566	.WORD 0	INGERT ZERO BYTE
159 000572	.CSECT RCDCOM	INGERT ZERO BYTE
160 000578	.WORD 0	INGERT ZERO BYTE
161 000584	.WORD 0	INGERT ZERO BYTE
162 000590	.WORD 0	INGERT ZERO BYTE
163 000596	.WORD 0	INGERT ZERO BYTE
164 000602	.WORD 0	INGERT ZERO BYTE
165 000608	.WORD 0	INGERT ZERO BYTE
166 000614	.WORD 0	INGERT ZERO BYTE
167 000620	.WORD 0	INGERT ZERO BYTE
168 000626	.WORD 0	INGERT ZERO BYTE
169 000632	.WORD 0	INGERT ZERO BYTE
170 000638	.WORD 0	INGERT ZERO BYTE
171 000644	.WORD 0	INGERT ZERO BYTE
172 000650	.WORD 0	INGERT ZERO BYTE
173 000656	.WORD 0	INGERT ZERO BYTE
174 000662	.WORD 0	INGERT ZERO BYTE
175 000668	.WORD 0	INGERT ZERO BYTE
176 000674	.WORD 0	INGERT ZERO BYTE
177 000680	.WORD 0	INGERT ZERO BYTE
178 000686	.WORD 0	INGERT ZERO BYTE
179 000692	.WORD 0	INGERT ZERO BYTE
180 000698	.WORD 0	INGERT ZERO BYTE
181 000704	.WORD 0	INGERT ZERO BYTE
182 000710	.WORD 0	INGERT ZERO BYTE
183 000716	.WORD 0	INGERT ZERO BYTE
184 000722	.WORD 0	INGERT ZERO BYTE
185 000728	.WORD 0	INGERT ZERO BYTE
186 000734	.WORD 0	INGERT ZERO BYTE
187 000740	.WORD 0	INGERT ZERO BYTE
188 000746	.WORD 0	INGERT ZERO BYTE
189 000752	.WORD 0	INGERT ZERO BYTE
190 000758	.WORD 0	INGERT ZERO BYTE
191 000764	.WORD 0	INGERT ZERO BYTE
192 000770	.WORD 0	INGERT ZERO BYTE
193 000776	.WORD 0	INGERT ZERO BYTE
194 000782	.WORD 0	INGERT ZERO BYTE
195 000788	.WORD 0	INGERT ZERO BYTE
196 000794	.WORD 0	INGERT ZERO BYTE
197 000800	.WORD 0	INGERT ZERO BYTE
198 000806	.WORD 0	INGERT ZERO BYTE
199 000812	.WORD 0	INGERT ZERO BYTE
200 000818	.WORD 0	INGERT ZERO BYTE
201 000824	.WORD 0	INGERT ZERO BYTE
202 000830	.WORD 0	INGERT ZERO BYTE
203 000836	.WORD 0	INGERT ZERO BYTE
204 000842	.WORD 0	INGERT ZERO BYTE
205 000848	.WORD 0	INGERT ZERO BYTE
206 000854	.WORD 0	INGERT ZERO BYTE
207 000860	.WORD 0	INGERT ZERO BYTE
208 000866	.WORD 0	INGERT ZERO BYTE
209 000872	.WORD 0	INGERT ZERO BYTE
210 000878	.WORD 0	INGERT ZERO BYTE
211 000884	.WORD 0	INGERT ZERO BYTE
212 000890	.WORD 0	INGERT ZERO BYTE
213 000896	.WORD 0	INGERT ZERO BYTE
214 000902	.WORD 0	INGERT ZERO BYTE
215 000908	.WORD 0	INGERT ZERO BYTE
216 000914	.WORD 0	INGERT ZERO BYTE
217 000920	.WORD 0	INGERT ZERO BYTE
218 000926	.WORD 0	INGERT ZERO BYTE
219 000932	.WORD 0	INGERT ZERO BYTE
220 000938	.WORD 0	INGERT ZERO BYTE
221 000944	.WORD 0	INGERT ZERO BYTE
222 000950	.WORD 0	INGERT ZERO BYTE
223 000956	.WORD 0	ING

172 000166  
 173 000000  
 174 000000  
 175 002034  
 176 000000  
 177 000000  
 178 000000  
 179 000000  
 180 000000

OUTBUF: .BLKW 2054.  
 .BLKB SCNCOM  
 .CSECT 526.  
 STATUS: .BLKW 0  
 .WORD 14  
 .CSECT IBUF  
 IBUF: .BLKW 2048.  
 .BLKW 14.  
 .END

;RECORDING BUFFER

;RAW DATA BUFFER

SYMBOL TABLE

BLKCNT	000070R	003	BLKNUH	000966R	003	BUFEND	000136R	003	CFIN	000142R	003	CSTRT	000104R	002
FBPNTN	000002R	003	FCLOSE=	***** G		IBUF	000034R	005	INB1	000200R		INB1P	000202R	
INC2	000162R	003	INC1	000322R		INCIP	000324R		INC2	000304R		INRBUF	000444R	
OBPNTR	000076R	003	OUT	000442R		OUTBUF	000166R	003	OUT1	000364R		PC	=%000007	
RC123	000226R	003	RC45	000154R		RC45E	000216R		RECORD	000000R		RE1	000000R	
NON	000000R	003	RSTART	000142R	003	RSTOP	000144R	003	R0	=%000000		R1	=%000001	
R2	=%000002		R3	=%000003		R4	=%000004		R5	=%000005		SP	=%000006	
STATUS	002034R	004	SIPADR	000526R		STPCHK	000340R		THXCD	000074R	003	TWMD	000262R	002
TWMDT	000362R	002	TWOFFS	000416R	002	WCALL	000522R		WPH	= ***** G		WRIBUF=	***** G	
WST	000472R													
. ABS.	000000	000												
	000530	001												
DSPCON	000420	002												
REDCON	000474	003												
SCRCON	072035	004												
IBUF	010034	003												

ERRORS DETECTED: 0  
FREE CORE: 17030. WORDS

.DK1:RECORD/N:TTM/E:LC=RECORD

```

1  .TITLE RKTOD
2  .GLOBL FFIND, FOPEN, ERRVD
3  .MCALL CHTXT, V2, ENTER, LOOKUP, EXIT, PRINT, RECD
4  .V2...
5  .RECD
6
7  ERRVD=52
8  LOOKUP FILE, IF IT EXISTS, RETURN 1 IN FSTAT
9  FFIND: MOV R0, -(SP)
10 CLR FSTAT
11 .LOOKUP #FAREA, CHNUM, FBPNTR !LOOKUP FIL
12 BCS FDI !IF ERROR GO TO FDI
13 MOV #1, FSTAT !SET FILE EXISTS FLAG
14 RTS (SP)+, R0 ; RESTORE R0
15 PC
16 TSTB @ERRVD ; CHECK ERROR WORD
17 BNE OUT
18 PRINT #NSC ; WRITE ERROR MESSAGE
19 .EXIT
20 CHTXT <CHANNEL ERROR - ATTEMPT TO OPEN CHANNEL WHICH IS ACTIVE, 1
21 .BYTE 0
22 .EVEN
23
24 ! FOPEN:
25 ! GREAT FILE, IF NOT ENOUGH SPACE RETURN 1 IN FSTAT1
26 ! MOV R0, -(SP)
27 ! FSTAT1
28 ! CLR BLKNUM
29 ! CLR READY1
30 ! CLR READY2
31 ! CLR BPNTR
32 ! .ENTER #FAREA, CHNUM, FBPNTR, #-1
33 ! BCS BADFIL !IF ERROR GO TO BADFIL
34 ! MOV R0, BLKCNT
35 ! (SP)+, R0
36 ! PC
37 ! TSTB @ERRVD
38 ! BEQ FDI
39 ! INC FSTAT1
40 ! BR OUT
41 ! FAREA:
42 ! .BLKW 6
43 ! .CSECT RCDCOM
44 ! .WORD 0
45 ! .WORD 0
46 ! .RAD50 /DK1/
47 ! .BLKW 19.
48 ! FSTAT:
49 ! .WORD 0
50 ! FSTAT1:
51 ! .WORD 0
52 ! CHNUM:
53 ! .BLKW 2
54 ! BLKNUM:
55 ! .WORD 0
56 ! BLKCNT:
57 ! .WORD 0
58 ! READY1:
59 ! .BLKW 11.
60 ! READY2:
61 ! .WORD 0
62 ! BPNTR:
63 ! .WORD 0
64 ! .BLKW 4
65 ! .WORD 0
66 ! .END

```

SYMBOL TABLE

BADFIL 000264R  
 ERRVD = 000052 C  
 FFIND 000000RC  
 NUM = 000002  
 READY1 000120R  
 R3 =X000003

. ABS. 000000  
 000314 001  
 RCLCON 000136 002  
 ERRORS DETECTED: 0  
 FREE CORE: 16301. WORDS

, DK1: RKMOD/N: TTM/E: LC= RKMOD

BLKINT 000070R  
 FAREA 000300R  
 FOPEN 000164RC  
 NUM1 = 000067  
 READY3 000122R  
 R4 =X000004

BLKNUM 000066R  
 FBPNTN 000002R  
 FSTAT 000034R  
 OUT 000050R  
 R0 =X000000  
 R5 =X000005

BPNTN 000134R  
 FD1 000054R  
 FSTAT1 000066R  
 PC =X000007  
 R1 =X000001  
 SP =X000006

CHNUM 000064R  
 FD2 000062R  
 MSC 000072R  
 MBUF 000004R  
 R2 =X000002  
 ...V2 = 000001

002  
 002

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR

LINE	ADDRESS	INSTR	OPERAND	COMMENT
1	000000	SAVE	01235	
2	000000	CLR	ICHBUF	
3	000000	JSR	PC, ERASE	
4	000000	MOV	R1R, R5	
5	000000	PC, CHOUT		PRINT WAVEFORM INPUT REQUEST
6	000000	JSR	ICHBUF	
7	000000	IS		WAIT FOR INPUT
8	000000	BEQ	000000	
9	000000	MOV	ICHBUF, WFD	
10	000000	MOV	ICHBUF, R0	
11	000000	CLR	ICHBUF	
12	000000	SUB	R0, R0	
13	000000	BLT		CHECK INPUT WITHIN RANGE
14	000000	CMP	R0, R2	
15	000000	BGT		
16	000000	BEQ	W2	
17	000000	MOV	R1R, R5	
18	000000	JSR	PC, CHOUT	
19	000000	MOV	R0CALL, R5	
20	000000	JSR	PC, GRIN	
21	000000	TST	R0	
22	000000	BNE	W1	
23	000000	MOV	R2R48, R3	
24	000000	MOV	R1BUF, R1	
25	000000	MOV	R0SINE+1024, R0	
26	000000	INC	IX	
27	000000	ASL	IX	
28	000000	NEG	(R0), R2	
29	000000	MOV	R0B, R2	
30	000000	TST	SIGN	
31	000000	BGT	R0	
32	000000	NEG	R2, (R1)+	
33	000000	MOV	IX, R0	
34	000000	ADD	R0, R0SINE	
35	000000	CHP	R0	
36	000000	BCE	R0	
37	000000	NEG	R0	
38	000000	ADD	R0SINE, R0	
39	000000	ADD	R0SINE, R0	
40	000000	NEG	IX	
41	000000	CHP	R0, R0SINE+1024	
42	000000	BLE	NTST	
43	000000	NEG	R0	
44	000000	ADD	R0SINE+1024, R0	
45	000000	ADD	R0SINE+1024, R0	
46	000000	NEG	IX	
47	000000	NEG	SIGN	
48	000000	BR	R3, NXT	
49	000000	SOB	OUT	
50	000000	JMP	R2R48, R3	
51	000000	MOV	IX	
52	000000	INC	R3, R0	
53	000000	MOV		

```

58 000272 000200
59 000274 000267 000562
60 000300 005767 000356
61 000304 003372 000350
62 000306 010067 000334
63 000312 012701 000346
64 000316 016721 000346
65 000322 005300
66 000324 003004 000330
67 000326 016700 000332
68 000332 005467 000332
69 000336 077311 000022
70 000340 000167 000000
71 000344 012703 000000
72 000350 012701 000034
73 000354 005021
74 000356 077302
75 000360 012767 000170 000034
76 000366
77 000400 000207
78 000402
79 000440
80 000470
81 000514
82 000542
83 000562
84 000624
85 000626
86 000636
87 000704
88 000762
89 001046
90 001050 000000
91 001056 001064
92 001062 000000
93 001064 000000
94 001066 000001
95 001070 000170
96 000000
97 000000
98 000000
99 000034
100 000034
101 000000
102 000000
103 000001

```

18: ASR  
 IX  
 IX  
 IX  
 R0,IX  
 1BUF,RI  
 SW, (R1)+  
 R0  
 NTST1  
 IX, R0  
 SW  
 R3, NKT1  
 OUT  
 2048, R3  
 1BUF, RI  
 (R1)+  
 R3, 18  
 120, 1BUF+2048  
 53210  
 PC  
 WIR, FIR, <SIMULATED DATA:>  
 <SELECT WAVEFORM>  
 <0=SINE WAVE>  
 <1=SQUARE WAVE>  
 <2=SPIKE>  
 FIR, END, <WAVE FORM SELECTED =>  
 0  
 <>  
 <SELECT FREQUENCY FROM JOYSTICD  
 <SCREEN LEFT = 1 CYCLE PER 2048 SAMPLES>  
 <SCREEN RIGHT = 1024 CYCLES PER 2048 SAMPLES>  
 0  
 3, 1ALPH, IX, IY  
 0  
 0  
 0  
 1  
 120  
 CALCOM  
 513  
 1BUF  
 2048  
 TEKCOM  
 0

NXT1:  
 NTST1:  
 V2:  
 18:  
 OUT:  
 VFD:  
 END:  
 CCALL:  
 1ALPH:  
 IX:  
 IY:  
 SIGN:  
 SW:  
 KOSINE:  
 1BUF:  
 1CHBUF:

;SET NEXT SQUARE WAVE VALUE  
 ;LOOP TO FILL BUFFER  
 ;SET UP TO PLACE SPIKE IN BUFFER

CHOUT = ***** C	EHD	001046R	ERASE = ***** C	003	FIR	000562R	CCALL	001050R
GRIN = ***** C	LALPH	001050R	IBUF	003	ICHEUF	000000R	IX	001062R
IY = 001064R	KOSINE	000000R	NTST	002	NTST1	000336R	NUM	= 000001
ROH = 000000	NXT	000130R	NXT1		OUT	000336R	PC	= %000007
R0 = %000000	R1	= %000001	R2		R3	= %000003	R4	= %000004
R5 = %000005	SIGN	001066R	SP		SWV	001070R	S0	000000RG
WFD	WIR	000402R	W1		W2	000344R		
. AFS.		000000						
		001072						
CALCON		002062						
IBUF		010034						
TERCON		000002						

ERRORS DETECTED: 0  
FREE CORE: 16729. WORDS

, BK1:SO/R:TTM/E:LG-S9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85															

C-104

SYMBOL TABLE

BELL = ***** C	CHOUT = ***** C	COMMAND	002976R	002	DSP	001300R	003	ERASE = ***** C	
CETRA 000132R	CEINCR 000132R	LOGRE = ***** C			1CHBUF	000000R		KR 000514R	
HR 000146R	HCDR 002050R	HCDRCV 002122R	002	002	NUH = 000002			NUMI = 000034	
OUT 000152R	PC = 00000003	QRCDR 000399R			R0 = 00000000			R1 = 00000001	
R2 = 00000002	R3 = 00000003	R4 = 00000004			R5 = 00000005			SBUF 000034R	002
SOURCE 0000000R	SP 002	SRCHTP 000002R		002	STATUS 002034R			S1 0000000R	
TRUF 001034R	TR 002	TX1 000004R		002	TX2 000012R			TY1 0000006R	002
TY2 000141R	TZ1 002	TZ2 000016R	002	002	MTLSI = ***** C				
. ALX. 000000									
STHCNH 001310									
TECHNH 001110									
TECHNH 000002									

ERASE DETECTED: 0

FREE CORE: 16000. MORES

.DEL: 01/4: THE/E: LC=01

```

1  .TITLE S2
2  .GLOBL S2,FRANIN,CHOUT,HOM,ERASE
3  .NCALL CHTXT,SUPTXT,CHSTUP,.RECDEF,...V2,...SAVESTATUS,.REOPEN,.CLOSE
4  .V2...
5  .REGDEF
6
7  SUBROUTINE S2 - SOURCE # 2
8  SETS UP TO READ FROM DISK
9  IF RECORDING IS ON, RETURNS
10 R5, -(SP)
11 NOV
12 TST
13 BRE
14 JSR
15 PC,ERASE
16 PC,HOM
17 .SAVESTATUS #AREA, RCHNUM, #AREA1 ; GET STATUS OF READ CHANNEL
18 TST AREA1
19 BGE 43
20 .REOPEN #AREA2, RCHNUM, #AREA1 ; GO TO 43 IF BIT 15 NOT SET CHANNEL NOT ACTIVE
21 .CLOSE
22 CLR RCHNUM
23 FBPWTR
24 BLKW
25 #ESC2, R5
26 PC,CHOUT
27 ICHBUF
28 TST ICHBUF
29 BEQ 33
30 CMP
31 BNE
32 NOV
33 JSR
34 TST
35 BRE
36 JSR
37 NOV
38 BR
39 RTS
40 .BLKW 2
41 .BLKW 5
42 .BLKW 2
43 .SUPTXT
44 .SUPTXT
45 .SUPTXT
46 .SUPTXT
47 .SUPTXT
48 .SUPTXT
49 .SUPTXT
50 .SUPTXT
51 .SUPTXT
52 .SUPTXT
53 .SUPTXT
54 .SUPTXT
55 .SUPTXT
56 .SUPTXT
57 .SUPTXT

```

AREA	000224R	AREA1	000230R	AREA2	000242R	BLKNUH	000066R	CHNUM	000064R		002
CHOUT	= ***** C	ERACE	= ***** C	FBP4TR	000002R	FNAHIN	= ***** C	FSTAT	000054R		002
HONE	= ***** C	ICHBUF	000000R	NSC1	000246R	NSC2	000310R	MSG3	000430R		002
NUM	= 000001	NUM1	= 000047	PC	= 0000007	RCHUM	000062R	RON	000000R		002
R0	= 0000000	R1	= 0000001	R2	= 0000002	R3	= 0000003	R4	= 0000004		
R5	= 0000005	SP	= 0000006	S2	0000000RG		... V2 = 000001				

. ABS. 000000 000  
RCDCOM 000430 001  
RCDCOM 000070 002  
TRACOM 000032 003  
ERRORS DETECTED: 0  
FREE CORE: 16399. WORDS

.DK1:32/H:TT/E:LC=S2

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

AREA	000224R	AREA1	000230R	AREA2	000242R	BLKNUM	000066R	CHNUM	000064R
CHOUT	= ***** G	ERASE	= ***** G	FBPNT	000002R	FNAHIN	***** G	FSTAT	000054R
HOME	= ***** C	ICHBUF	000000R	NSC1	000246R	NSC2	000310R	MSG3	000430R
NUM	= 000001	NUM1	= 000047	PC	=X000007	RCHNUM	000062R	RON	000000R
R0	=X000000	R1	=X000001	R2	=X000002	R3	=X000003	R4	=X000004
R5	=X000005	SP	=X000006	S2	0000000R	...V2	= 000001		
ABS.	000000								
	000430								
RCMCOM	000070								
TELCOM	000002								
ERRORS DETECTED:	0								
FREE CORE:	16399. WORDS								

.BK1:02/N:YTM/E:LC=S2

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



57	000332	012122	MOV	(R1)+(R2)+	!GET LOW X LIMIT
58	000333	012122	MOV	(R1)+(R2)+	!LOW Y LIMIT
59	000336	005721	TST	(R1)+	!SKIP Z LIMIT
60	000340	012122	MOV	(R1)+(R2)+	!HIGH X LIMIT
61	000342	012112	MOV	(R1)+(R2)+	!HIGH Y LIMIT
62	000344	026742	CMF	XLIN1, -(R2)	!SORT LIMITS
63	000350	014005	BLOS	13	!IF IN ORDER, SKIP
64	000352	016701	MOV	XLIN1, R1	!SWAP LIMITS
65	000356	011267	MOV	(R2), XLIN1	
66	000362	010112	MOV	R1, (R2)	
67	000364	024267	CMF	-(R2), YLIN2	
68	000370	014005	BLOS	20	
69	000372	011201	MOV	(R2), R1	!SORT Y LIMITS
70	000374	016712	MOV	YLIN2, (R2)	
71	000400	010167	MOV	R1, YLIN2	
72	000404	012767	MOV	*4, CONAND	
73	000412	014200	MOV	-(R2), R0	!COMMAND #4=SCAN
74	000414	010067	MOV	R0, CMDAT	!GET LOW X LIMIT
75	000420	005722	TST	(R2)+	!PUT IN COMMAND DATA
76	000422	012267	MOV	(R2)+, CMDAT+2	
77	000426	012203	MOV	(R2)+, R3	!GET LOW Y LIMIT
78	000430	010367	MOV	R3, CMDAT+4	!GET UPPER X LIMIT
79	000434	012267	MOV	(R2)+, CMDAT+6	!INSERT IN COMMAND
80	000440	016767	MOV	AXIS, CMDAT+B	!GET UPPER Y LIMIT
81	000446	160003	SUB	R0, R3	!GET SCAN AXIS
82	000450	010301	MOV	R3, R1	!R3=XLIN2-XLIN1
83	000452	005002	CLR	R2	
84	000454	071267	DIV	NUMPNT, R2	!DIVIDE BY NUMBER OF POINTS
85	000460	073227	ASRC	*-16, R3	!GET MULT OF 10
86	000464	071227	DIV	*10, R2	
87	000470	070227	MUL	*10, R2	
88	000474	010302	MOV	R3, R2	
89	000476	020267	CMF	R2, DXRIN	!CHECK AGAINST MINIMUM INCREMENT
90	000502	003002	BCT	38	
91	000504	016702	MOV	DXRIN, R2	!IF LESS THAN, USE MINIMUM
92	000510	005000	CLR	R0	!ADJUST LIMITS FOR ROUND MULTIPLE OF INCREMENT
93	000512	071002	DIV	R2, R0	!DIVIDE DIFFERENCE BY INCREMENT
94	000514	005401	NEG	R1	!NEGATE REMAINDER
95	000516	060201	ADD	R2, R1	!ADD INCREMENT TO REMAINDER OF DIVISION TO GET SUBSTPALL
96	000520	060167	ADD	R1, CMDAT+4	!INCREASE HIGH LIMIT TO ALLOW EVEN MULTIPLE
97	000524	016701	MOV	YLIN1, R1	!ADJUST Y AXIS LIMITS
98	000530	165701	SUB	YLIN2, R1	
99	000534	005000	CLR	R0	
100	000536	071002	DIV	R2, R0	
101	000540	160167	SUB	R1, CMDAT+6	
102	000544	016707	MOV	OFFS, CMDAT+12	!SET OFFSET SCAN FLAG
103	000552	010267	MOV	R2, CMDAT+10	!SET INCREMENT
104	000556	005007	CLR	NCRCV	!CLEAR "ENCODERS RECIEVED"
105	000562	012700	MOV	*B, R0	!EIGHT WORD COMMAND
106	000566	004707	JSR	PC, NSH	
107	000572	005367	DFC	STATUS	!SET "SCAN IN PROGRESS", STATUS +1
108	000576	004707	JSR	PC, WRTLSI	!SEND COMMAND
109	000602	000167	JMP	CNTSCN	!CONTINUE SCAN
110	000606	005267	INC	CONIP	!DISABLE INTERRUPT
111	000612	042737	BIC	*100, 0167740	
112	000620		SAVE	01	
113	000624	012701	MOV	*CONAND, R1	!ADDRESS OF COMMAND BUFFER

114 000630	000311	SWAB	(R1)			
115 000632	110011	MOV	RG,(R1)			
116 000634	012137	MOV	(R1)+,0#167742			
117 000640	052737	BIS	#2,0#167740			!SEND WORD
118 000646	10#737	TSTB	0#167740			!SET INTERRUPT
119 000652	002375	BGE	18			!WAIT FOR ACKNOWLEDGE
120 000654	042737	BIC	#2,0#167740			!CLEAR INTERRUPT
121 000662	105737	TSTB	0#167740			!WAIT FOR '45 TO CLEAR
122 000666	002775	BLT	23			!CO AROUND AGAIN
123 000670	077017	SOB	RG,WR1			
124 000672		UNSAVE	10			
125 000676		DEC	COHIP			
126 000702		RTS	PG			!RETURN TO SCAN2
127 000700	005367	.CSECT	DSPCON			
128 000700	000207	.CSECT	SCNCON			
129 000700	000000	.WORD	0			
130 000700	000000	.WORD	0			
131 000700	000000	.WORD	0			
132 000700	000000	.WORD	0			
133 000700	000000	.WORD	0			
134 000700	000000	.WORD	0			
135 000700	000000	.WORD	0			
136 000700	000000	.WORD	0			
137 000700	000000	.WORD	0			
138 000700	000000	.WORD	0			
139 000700	000000	.WORD	0			
140 000700	000000	.WORD	0			
141 000700	000000	.WORD	0			
142 000700	000000	.WORD	0			
143 000700	000000	.WORD	0			
144 000700	000000	.WORD	0			
145 000700	000000	.WORD	0			
146 000700	000000	.WORD	0			
147 000700	000000	.WORD	0			
148 000700	000000	.WORD	0			
149 000700	000000	.WORD	0			
150 000700	000000	.WORD	0			
151 000700	000000	.WORD	0			
152 000700	000000	.WORD	0			
153 000700	000000	.WORD	0			
154 000700	000000	.WORD	0			
155 000700	000000	.WORD	0			
156 000700	000000	.WORD	0			
157 000700	000000	.WORD	0			
158 000700	000000	.WORD	0			
159 000700	000000	.WORD	0			
160 000700	000000	.WORD	0			
161 000700	000000	.WORD	0			
162 000700	000000	.WORD	0			
163 000700	000000	.WORD	0			
164 000700	000000	.WORD	0			
165 000700	000000	.WORD	0			
166 000700	000000	.WORD	0			
167 000700	000000	.WORD	0			
168 000700	000000	.WORD	0			
169 000700	000000	.WORD	0			
170 000700	000000	.WORD	0			

!COMMAND TO LSI-11  
!COIFAND DATA  
!ENCODED RECEIVED FLAG  
!SCAN FINISHED FLAG  
!SCAN AXIS  
!NUMBER OF POINTS ON SCAN AXIS  
!MINIMUM INCREMENT IN X/Y PLANE  
!DATA FROM LSI-11  
!ERROR FLAG  
!COMMUNICATIONS IN PROGRESS

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SCANS RT-11 MACRO VHS2-12 21-NOV-79 PAGE 1+

000001'

121

.END

### SYMBOL TABLE

```

003 ARIVED 002164R 003 ARM = ***** C
003 CHDAT 002100R 003 CRTSCN 000132R
003 DTPPE 000000R 003 DXMIN 002133R
003 NCDR 002050R 003 NCDCRV 002122R
003 OUT1 000106R 003 PC =%000007
      =%000000 RI =%000001
      =%000005 SBUF 000034R
003 SCNFIN 002124R 003 SOURCE 000000R
003 STJNP 000040R 003 SUZCN 000322R
003 TYT2 000030R 003 SZ1 000024R
003 TYLSCN 000314R 003 TX1 000004R
003 TZ1 000010R 003 TZ2 000016R
003 XDIR 002036R 003 XLIM1 002066R
003 YLIM1 002070R 003 YLIM2 002074R
      . ABS. 000000
      000704 001
      000002 002
      SCNCOM 00172 003
      DRCCON C0302 004
      ERRORS DETECTED: 0
      FREE CORE: 16399. WORDS

```

003	AXIS	002126R
003	COMAND	002076R
003	ERROR	002162R
003	NUMPNT	002130R
	PNTSCH	000222R
	R2	=X000082
003	SCAN	0000000RG
003	SP	=X000006
	SX1	000020R
003	SZ2	000632R
003	TX2	000012R
003	WTLIS1	000000RG
003	XLIN2	002072R
003	YPNT	002044R

003	BEGSCN	000170R	003
003	CONIP	002166R	003
003	LSIDAT	002134R	003
003	OFSE	002170R	003
003	PULSE	000046R	003
	R3	=X000003	
	SCLJMP	000212R	003
003	SRCKTP	000002R	003
003	SR2	000026R	003
003	TX2	001034R	003
003	TY1	000006R	003
	WR1	000634R	003
003	XPNT	002042R	003
003	ZPNT	002046R	003

```

B8100 = ***** G 003
CONSP= ***** G 003
LSINT= ***** G 003
OUT 000116R 003
P1 000074R 003
R4 =X0000004 003
SCN 000326R 003
STATUS 002034R 003
SY1 000022R 003
TPCNT 000000R 003
TY2 000014R 003
WSH = ***** G 003
YDIR 002040R 003

```

**,DK1:SCAN/N:TTM/E:LC=SCAN**

```

1 1 000000 .TITLE SCAND
2 2 000000 .CLOSE CONDSP,CHROUT,ERASE,HOM,SCAND
3 3 000000 .MCALL .CLOSE,.RCTL0,.PRINT,.RECDEF,.READY,.EXIT,...V2..
4 4 000000 .MCALL .SAVE,.UNSAVE,CHTXT,SUPTXT,CHSTUP
5 5 000000 .V2..
6 6 000000 .RECDEF
7 7 000000 CMP 026727 000000 SCAND:
8 8 000000 BEQ 001401
9 9 000000 RTS 000207
10 10 000000 TST 000666 10:
11 11 000000 BNE 000767
12 12 000000 JSR 000474
13 13 000000 MOV 177777 002034 20:
14 14 000000 MOV 000076
15 15 000000 JSR 000464
16 16 000000 MOV 000464
17 17 000000 BEQ 177776
18 18 000000 CMP 022703
19 19 000000 BEQ 001436
20 20 000000 CMP 022703
21 21 000000 BNE 000744
22 22 000000 JSR 000066
23 23 000000 BR 000767
24 24 000000 JSR 000070
25 25 000000 JSR 000074
26 26 000000 MOV 001310
27 27 000000 JSR 000090
28 28 000000 MOV 000110
29 29 000000 JSR 000004 000000
30 30 000000 CLR 000067
31 31 000000 TST 000767
32 32 000000 BEQ 001775
33 33 000000 CLR 000067
34 34 000000 .CLOSE
35 35 000000 RTS
36 36 000000 JSR 000150
37 37 000000 JSR 000154
38 38 000000 MOV 012705
39 39 000000 JSR 000164
40 40 000000 CLR 000067
41 41 000000 TST 000067
42 42 000000 BEQ 001775
43 43 000000 BR 000715
44 44 000000 MOV 000066
45 45 000000 MOV 001234
46 46 000000 JSR 000306
47 47 000000 MOV 012230
48 48 000000 S0B 000034
49 49 000000 MOV 012704
50 50 000000 MOV 016700
51 51 000000 BEQ 001407
52 52 000000 CLC 000241
53 53 000000 R0R 000000
54 54 000000 BCC 103002
55 55 000000 CLRB 000033
56 56 000000 CLR 103000
57 57 000000 S0B 000252
58 58 000000 MOV 077002
59 59 000000 MOV 001240
60 60 000000
61 61 000000
62 62 000000
63 63 000000
64 64 000000
65 65 000000
66 66 000000
67 67 000000
68 68 000000
69 69 000000
70 70 000000
71 71 000000
72 72 000000
73 73 000000
74 74 000000
75 75 000000
76 76 000000
77 77 000000
78 78 000000
79 79 000000
80 80 000000
81 81 000000
82 82 000000
83 83 000000
84 84 000000
85 85 000000
86 86 000000
87 87 000000
88 88 000000
89 89 000000
90 90 000000
91 91 000000
92 92 000000
93 93 000000
94 94 000000
95 95 000000
96 96 000000
97 97 000000
98 98 000000
99 99 000000
100 100 000000

```

:CHECK FOR RECORDED DATA  
 :IF SOURCE IS DISK , SKIP  
 :IF NOT RETURN  
 :CHECK FOR NEW FILE  
 :GET NEW DATA FOR FIRST BLOCK IN FILE  
 :SET STATUS TO 'NO SCAN'  
 :GET BLOCK POINTER  
 :GET NEW DATA (IF NEEDED)  
 :GET RECORD ID  
 :IF ZERO (POINT HEADER) GO TO S3C  
 :IF -2 (SCAN TRAILER) GO TO S2C  
 :IF NOT, SKIP  
 :GET SCAN HEADER  
 :GO CHECK FOR POINT HEADER  
 :IF NOT SCAN TRAILER, EOF  
 :WRITE EOF MESSAGE  
 :SET SOURCE TO RESERVED VALUE  
 :WAIT FOR INPUT FROM KEYBOARD  
 :DISCARD FILE BLOCK  
 :CLOSE READ CHANNEL  
 :SET UP TO MOVE 6 VALUES  
 :GET NEW DATA IF NEEDED  
 :GO AGAIN  
 :CLEAR BUFFER UP TO RSTART  
 :GET START VALUE

REPRODUCIBILITY OF T  
ORIGINAL PAGE IS POO

58	000260	110324	001224	000002	MOV	R3,(R4)+	: INSERT START VALUE
59	000262	016767	001220	000006	MOV	ITDLY1,ATDLY1+2	: RESET COMMON VALUES
60	000270	016767	001220	000006	MOV	ITDLY2,ATDLY2+2	: WE MAY BE IN ZOOH
61	000276	016767	001214	000012	MOV	ITDLY3,ATDLY3+2	:
62	000304	016767	001176	000000	MOV	IUTS,IUTS	
63	000312	016767	001172	000002	MOV	IIRNG,IIRNG	
64	000320	004767	000202		JSR	PC,NEWDAT	: GET NEW DATA IF NEEDED
65	000324	112201			MOV	(R2)+,R1	: GET COMMAND
66	000326	073027	000010		ASHC	*8.,R0	
67	000332	005000			CLR	*9.,R0	: SEPERATE COMMAND & COUNT
68	000334	073027	000003		ASHC	R0	
69	000340	006300			ASL	R0	
70	000342	000301			SWAB	R1	
71	000344	072127	177775		ASH	*-3.,R1	
72	000350	001005			BNE	10	
73	000352	004767	000150		JSR	PC,NEWDAT	
74	000356	112201			MOV	(R2)+,R1	: GET COUNT
75	000360	042701	177400		BIC	*177400,R1	: REMOVE SICH EXTENSION
76	000364	000170	000370		JMP	ESCJ(R0)	: JUMP TO PROPER ROUTINE
77	000370	000452	000410	000416	.WORD	SC0,SC1,SC2,SC3,SC4,SC5,SC6,SC7	
	000376	000426	000436	000444			
	000404	000452	000452				
78	000410	110324			MOV	R3,(R4)+	: INSERT VALUE
79	000412	077102			SUB	R1,SC1	: GO AGAIN
80	000414	000741			BR	SC	
81	000416	005203			INC	R3	: UP ONE
82	000420	110324			MOV	R3,(R4)+	: INSERT VALUE
83	000422	077102			SUB	R1,10	: GO AGAIN
84	000424	000735			BR	SC	
85	000426	005303			DEC	R3	: DOWN ONE
86	000430	110324			MOV	R3,(R4)+	: INSERT VALUE
87	000432	077102			SUB	R1,10	: GO AGAIN
88	000434	000731			BR	SC	
89	000436	000103			ADD	R1,R3	: UP COUNT
90	000440	110324			MOV	R3,(R4)+	: INSERT VALUE
91	000442	000726			BR	SC	
92	000444	160103			SUB	R1,R3	: DOWN COUNT
93	000446	110324			MOV	R3,(R4)+	: INSERT VALUE
94	000450	000723			BR	SC	
95	000452						
96	000452						
97	000452	012700	004034		MOV	*10UP+2048.,R0	: GET END OF BUFFER
98	000456	160400			SUB	R4,R0	: COMPUTE NUMBER OF VALUES
99	000460	003407			BLE	30	
100	000462	000241			CLC		
101	000464	006000			ROR	R0	
102	000466	003404			BLE	30	
103	000470	103901			BOC	10	
104	000472	105024			CLRB	(R4)+	: CLEAR WORD
105	000474	005024			CLR	(R4)+	: GO AGAIN
106	000476	077002			SUB	R0,10	: CHECK ODD ADDRESS
107	000500	032702	000001		BIT	*1,R2	: IF NOT, SKIP
108	000504	001401			BEQ	20	: SKIP ONE BYTE BACK (ODR IS 1 BYTE IF ODD ADDRESS)
109	000506	005302	000076		DEC	R3	: UPDATE POINTER
110	000510	010267	177426		MOV	R2,ORPTR	
111	000514	000167			JMP	OUT	
112	000520				SAVE	05	

BR	NEWDAT:	ND1:	ND2:	ND3:	ND4:	ND5:	ND6:	ND7:	ND8:	ND9:	ND10:	ND11:	ND12:	ND13:	ND14:	ND15:	ND16:	ND17:	ND18:	ND19:	ND20:	ND21:	ND22:	ND23:	ND24:	ND25:	ND26:	ND27:	ND28:	ND29:	ND30:	ND31:	ND32:	ND33:	ND34:	ND35:	ND36:	ND37:	ND38:	ND39:	ND40:	ND41:	ND42:	ND43:	ND44:	ND45:	ND46:	ND47:	ND48:	ND49:	ND50:	ND51:	ND52:	ND53:	ND54:	ND55:	ND56:	ND57:	ND58:	ND59:	ND60:	ND61:	ND62:	ND63:	ND64:	ND65:	ND66:	ND67:	ND68:	ND69:	ND70:	ND71:	ND72:	ND73:	ND74:	ND75:	ND76:	ND77:	ND78:	ND79:	ND80:	ND81:	ND82:	ND83:	ND84:	ND85:	ND86:	ND87:	ND88:	ND89:	ND90:	ND91:	ND92:	ND93:	ND94:	ND95:	ND96:	ND97:	ND98:	ND99:	ND100:	ND101:	ND102:	ND103:	ND104:	ND105:	ND106:	ND107:	ND108:	ND109:	ND110:	ND111:	ND112:	ND113:	ND114:	ND115:	ND116:	ND117:	ND118:	ND119:	ND120:	ND121:	ND122:	ND123:	ND124:	ND125:	ND126:	ND127:	ND128:	ND129:	ND130:	ND131:	ND132:	ND133:	ND134:	ND135:	ND136:	ND137:	ND138:	ND139:	ND140:	ND141:	ND142:	ND143:	ND144:	ND145:	ND146:	ND147:	ND148:	ND149:	ND150:	ND151:	ND152:	ND153:	ND154:	ND155:	ND156:	ND157:	ND158:	ND159:	ND160:	ND161:	ND162:	ND163:	ND164:	ND165:	ND166:	ND167:	ND168:	ND169:	ND170:	ND171:	ND172:	ND173:	ND174:	ND175:	ND176:	ND177:	ND178:	ND179:	ND180:	ND181:	ND182:	ND183:	ND184:	ND185:	ND186:	ND187:	ND188:	ND189:	ND190:	ND191:	ND192:	ND193:	ND194:	ND195:	ND196:	ND197:	ND198:	ND199:	ND200:	ND201:	ND202:	ND203:	ND204:	ND205:	ND206:	ND207:	ND208:	ND209:	ND210:	ND211:	ND212:	ND213:	ND214:	ND215:	ND216:	ND217:	ND218:	ND219:	ND220:	ND221:	ND222:	ND223:	ND224:	ND225:	ND226:	ND227:	ND228:	ND229:	ND230:	ND231:	ND232:	ND233:	ND234:	ND235:	ND236:	ND237:	ND238:	ND239:	ND240:	ND241:	ND242:	ND243:	ND244:	ND245:	ND246:	ND247:	ND248:	ND249:	ND250:	ND251:	ND252:	ND253:	ND254:	ND255:	ND256:	ND257:	ND258:	ND259:	ND260:	ND261:	ND262:	ND263:	ND264:	ND265:	ND266:	ND267:	ND268:	ND269:	ND270:	ND271:	ND272:	ND273:	ND274:	ND275:	ND276:	ND277:	ND278:	ND279:	ND280:	ND281:	ND282:	ND283:	ND284:	ND285:	ND286:	ND287:	ND288:	ND289:	ND290:	ND291:	ND292:	ND293:	ND294:	ND295:	ND296:	ND297:	ND298:	ND299:	ND300:	ND301:	ND302:	ND303:	ND304:	ND305:	ND306:	ND307:	ND308:	ND309:	ND310:	ND311:	ND312:	ND313:	ND314:	ND315:	ND316:	ND317:	ND318:	ND319:	ND320:	ND321:	ND322:	ND323:	ND324:	ND325:	ND326:	ND327:	ND328:	ND329:	ND330:	ND331:	ND332:	ND333:	ND334:	ND335:	ND336:	ND337:	ND338:	ND339:	ND340:	ND341:	ND342:	ND343:	ND344:	ND345:	ND346:	ND347:	ND348:	ND349:	ND350:	ND351:	ND352:	ND353:	ND354:	ND355:	ND356:	ND357:	ND358:	ND359:	ND360:	ND361:	ND362:	ND363:	ND364:	ND365:	ND366:	ND367:	ND368:	ND369:	ND370:	ND371:	ND372:	ND373:	ND374:	ND375:	ND376:	ND377:	ND378:	ND379:	ND380:	ND381:	ND382:	ND383:	ND384:	ND385:	ND386:	ND387:	ND388:	ND389:	ND390:	ND391:	ND392:	ND393:	ND394:	ND395:	ND396:	ND397:	ND398:	ND399:	ND400:	ND401:	ND402:	ND403:	ND404:	ND405:	ND406:	ND407:	ND408:	ND409:	ND410:	ND411:	ND412:	ND413:	ND414:	ND415:	ND416:	ND417:	ND418:</
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REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

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170 001132 006700
171 001134 071027 000012
172 001140 010167 000006
173 001144 010067 000002
174
175 001150 016767 010012 000346
176 001156 016767 000002 000326
177 001164 016767 000006 000322
178 001172 016767 000012 000316
179 001200 016767 000002 000302
180 001206 016767 000000 000273
181
182 001214 000067 000000
183 001220 000767 000000
184 001224 001775
185 001226
186 001232 000207
187 001234 002042 000142 000142
188 001242 000144 000416 001520
189 001250 002066 002070 002072
190 001256 002074 002046
191 001262 001522 000000 000002
192 001270 002132 000100
193 001274 000102 000104 000106
194 001302 000110 000112 002170
195
196 001506 000000
197 001510 000000
198 001512 000000
199 001514 000000
200 001516 000000
201 001520 000000
202 001522 000000
203 001524 000000
204 000000 000000
205 000000 000000
206 000000 000000
207 000002 000000
208
209 000002 000002
210 000004 000000
211 000006 000000
212
213 000076 000000
214 000100 000000
215 000106 000000
216 000114 000001
217
218 000142 000000
219 000144 000000
220
221 000166 000000
222

```

END OF CONVERSION  
;SET DATA PARAMETERS IN INTERNAL BUFFER

NO  
;10, R0  
R1, ATDLY2+2  
R0, ATDLY1+2  
STARTX, STAX  
ATDLY1+2, ITDLY1  
ATDLY2+2, ITDLY2  
ATDLY3+2, ITDLY3  
IRNG, IIRNG  
IUTS, IUTS  
ICBUUF  
ICBUUF  
; WAIT FOR KEY  
SS  
SS  
PC  
; RETURN TO SCAND  
XPNT, YPNT, RSTART, RSTOP, TWOFFS, SVAL  
XLINI, YLINI, XLIN2, YLIN2, ZPNT  
TDLY, IUTS, IRNG, DCHIN, XDCRID  
XDCRID+2, XDCRID+4, SHFLID, SHFLID+2, SHFLID+4, OFSP  
MSG3, MSG4, <END OF FILE ON READ PRESS KEY TO CONTINUE>  
MSG4, MSG3, <NEW SCAND>  
MSG3, MSG6, <END OF SCAN, PRESS KEY TO CONTINUE>

SXT  
DIV  
MOV  
MOV  
MOV  
MOV  
MOV  
MOV  
MOV  
CLR  
TST  
REQ  
UNSAVE  
RTS  
; WORD  
; WORD  
; WORD  
; WORD  
SUPTXT  
SUPTXT  
SUPTXT

IRNG:  
IUTS:  
IIRNG:  
ITDLY1:  
ITDLY2:  
ITDLY3:  
SVAL:  
TDLY:  
STAX:  
ICBUUF:  
FBPTR:  
RCHURN:  
BLKNUM:  
OBUPTTR:  
XDCRID:  
SHFLID:  
CHFLYP:  
RSTART:  
RSTOP:  
OUTBUF:

0  
0  
0  
0  
0  
0  
0  
0  
0  
TEKCON  
0  
RCDCON  
0  
0  
23  
2  
0  
3  
; OUTBUF POINTER (INDEX)  
6  
6  
1  
10  
0  
0  
8  
2048  
IBUF

; FILE BLOCK POINTER INDEX  
; READ CHANNEL NUMBER  
; BLOCK NUMBER IN FILE  
; OUTBUF POINTER (INDEX)  
; COMPRESSION TYPE  
; DISK BUFFER

```

223 003000 000000
224 000002 000000
225
226 000034 000000
227
228 000000
229 000004
230 000010
231
232 000000
233 000000
234 002034 000000
235
236 002042 000000
237 002044 000000
238 002046 000000
239
240 002066 000000
241 002070 000000
242 002072 000000
243 002074 000000
244
245 002132 000062
246
247 002170 000001
248 000000
249
250 010012 000000
251 010014 000000
252
253
254 010034 000000
255 000000
256
257 000416 000000
258 000001

```

IUTS: .WORD 0  
 IIRC: .WORD 0  
 IBUF: .BLKW 12.  
 .BLKW 2048.  
 ATBLV1: .CSECT ATPARA  
 .BLKW 2  
 ATBLV2: .BLKW 2  
 ATBLV3: .BLKW 2  
 SOURCE: .CSECT SCRCOM  
 .WORD 0  
 .BLKW 528.  
 STATUS: .WORD 0  
 .BLKW 2  
 XPPT: .WORD 0  
 YPPT: .WORD 0  
 ZPPT: .WORD 0  
 .BLKW 7  
 XLINI: .WORD 0  
 YLINI: .WORD 0  
 XLINI2: .WORD 0  
 YLINI2: .WORD 0  
 .BLKW 14.  
 DXINI: .WORD 50.  
 .BLKW 14.  
 OFSP: .WORD 1  
 .CSECT NTRCOM  
 .BLKW 2063.  
 STARTX: .WORD 0  
 STUFX: .WORD 0  
 ;  
 THRESH: .BLKW 7.  
 .WORD 0  
 .CSECT DSPCOM  
 .BLKW 416  
 TWOFTS: .WORD 0  
 .END

; DATA SOURCE  
 ; DESTINATION FOR POINT SCAN  
 ; LOW XLIMIT FOR SCAN  
 ; LO Y VALU FOR SCAN  
 ; HIGH X VALU FOR SCAN  
 ; HI Y VLAD FOR SCAN  
 ; ADDRESS OF LOW WORD TO BE PROCESSED  
 ; HI RAW DATA VALUE TO BE PROCESSED  
 ; STARTX AND STUFX ARE RELATIVE TO START OF IBUF  
 ; SCAN THRESHOLD  
 ; TIME WINDOWS OFFSET

SYMBOL TABLE

AREA	000700R	ATLY1	000000R	003	ATLY2	000004R	003	ATLY3	000010R	003	BLKINH	000066R	003
CHOUT =	xxxxx G	CRPTTP	000114R	003	CONDSP=	xxxxx G	003	DXMIN	002182R	004	ERASE =	xxxxx G	003
FRPNTA	000002R	GTSE	001032R	004	HOME =	xxxxx G	004	IBUF	000034R	004	ICRBUF	000000R	003
ITRNC	001510R	IUTS	001036R	004	IRNG	000002R	004	ITELY1	001512R	004	ITWLT2	001514R	003
ITDLY3	001516R	IUTS	000000R	004	MSC1	000036R	004	MSC3	001310R	004	MSC4	001400R	003
FLX3	001436R	MSC6	001006R	006	ND1	000040R	006	ND2	000712R	006	ND4	001004R	003
HUG	001030R	NEVDAT	000526R	006	NEV1	000520R	006	R/M	000002	003	NUH1	000042	003
OWNTR	000076R	OFST	002170R	003	OUT	000146R	003	OUTBUF	000166R	003	PC	000007.	003
REJURN	000062R	RSTRT	000142R	003	R4	000144R	003	R5	000000	003	R1	0000001	003
B2	000002	R3	0000003	003	R4	0000004	003	R5	0000005	003	SC	0000000	003
SCAND	000000RC	SCJ	000370R	003	SC3	000452R	003	SC1	000410R	003	SC2	000416R	003
SC3	000426R	SC4	000436R	003	SC3	000444R	003	SC5	000452R	003	SC7	000462R	003
SHPLIB	000106R	SOURCE	000000R	003	SP	0000006	003	STARTX	010012R	007	STATUS	000034R	006
STAX	001524R	STUPX	010014R	007	SVAL	001520R	007	SIC	000036R	007	THRESH	010034R	007
SSAC	000204R	S4C	000070R	010	TDLY	001522R	010	THINE	001234R	006	XLIN2	002072R	006
TU	001230R	TWOFFS	000416R	006	YLINE	000100R	006	YLINE	002066R	006	ZPNT	002046R	006
XPNT	003042R	YLINE	002070R	006									
...V2 =	000001			000									
. ABS.	000000			001									
TUCCOM	001526			002									
NCBCOM	000002			003									
IBUF	004166			004									
ATTARA	010034			005									
SCBCOM	000014			006									
NTROCOM	002172			007									
BSFCOM	010036			010									
BSFCOM	000420			010									
KNOWNS DETECTED: 0													
FREE CORE: 15966. WORDS													

.BKI:SCAND/H:TTR/E:LG-SCAND

1	SCNDRP	RT-11	NACIO	VMD-12	21-NOV-79	PAGE 1
2	1	2	3	4	5	6
3	7	8	9	10	11	12
4	13	14	15	16	17	18
5	19	20	21	22	23	24
6	25	26	27	28	29	30
7	31	32	33	34	35	36
8	37	38	39	40	41	42
9	43	44	45	46	47	48
10	49	50	51	52	53	54
11	55	56	57	58	59	60
12	61	62	63	64	65	66
13	67	68	69	70	71	72
14	73	74	75	76	77	78
15	79	80	81	82	83	84
16	85	86	87	88	89	90
17	91	92	93	94	95	96
18	97	98	99	100	101	102
19	103	104	105	106	107	108
20	109	110	111	112	113	114
21	115	116	117	118	119	120
22	121	122	123	124	125	126
23	127	128	129	130	131	132
24	133	134	135	136	137	138
25	139	140	141	142	143	144
26	145	146	147	148	149	150
27	151	152	153	154	155	156
28	157	158	159	160	161	162
29	163	164	165	166	167	168
30	169	170	171	172	173	174
31	175	176	177	178	179	180
32	181	182	183	184	185	186
33	187	188	189	190	191	192
34	193	194	195	196	197	198
35	199	200	201	202	203	204
36	205	206	207	208	209	210
37	211	212	213	214	215	216
38	217	218	219	220	221	222
39	223	224	225	226	227	228
40	229	230	231	232	233	234
41	235	236	237	238	239	240
42	241	242	243	244	245	246
43	247	248	249	250	251	252
44	253	254	255	256	257	258
45	259	260	261	262	263	264
46	265	266	267	268	269	270
47	271	272	273	274	275	276
48	277	278	279	280	281	282
49	283	284	285	286	287	288
50	289	290	291	292	293	294
51	295	296	297	298	299	300
52	301	302	303	304	305	306
53	307	308	309	310	311	312
54	313	314	315	316	317	318
55	319	320	321	322	323	324
56	325	326	327	328	329	330
57	331	332	333	334	335	336
58	337	338	339	340	341	342
59	343	344	345	346	347	348
60	349	350	351	352	353	354
61	355	356	357	358	359	360
62	361	362	363	364	365	366
63	367	368	369	370	371	372
64	373	374	375	376	377	378
65	379	380	381	382	383	384
66	385	386	387	388	389	390
67	391	392	393	394	395	396
68	397	398	399	400	401	402
69	403	404	405	406	407	408
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71	415	416	417	418	419	420
72	421	422	423	424	425	426
73	427	428	429	430	431	432
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75	439	440	441	442	443	444
76	445	446	447	448	449	450
77	451	452	453	454	455	456
78	457	458	459	460	461	462
79	463	464	465	466	467	468
80	469	470	471	472	473	474
81	475	476	477	478	479	480
82	481	482	483	484	485	486
83	487	488	489	490	491	492
84	493	494	495	496	497	498
85	499	500	501	502	503	504
86	505	506	507	508	509	510
87	511	512	513	514	515	516
88	517	518	519	520	521	522
89	523	524	525	526	527	528
90	529	530	531	532	533	534
91	535	536	537	538	539	540
92	541	542	543	544	545	546
93	547	548	549	550	551	552
94	553	554	555	556	557	558
95	559	560	561	562	563	564
96	565	566	567	568	569	570
97	571	572	573	574	575	576
98	577	578	579	580	581	582
99	583	584	585	586	587	588
100	589	590	591	592	593	594
101	595	596	597	598	599	600
102	601	602	603	604	605	606
103	607	608	609	610	611	612
104	613	614	615	616	617	618
105	619	620	621	622	623	624
106	625	626	627	628	629	630
107	631	632	633	634	635	636
108	637	638	639	640	641	642
109	643	644	645	646	647	648
110	649	650	651	652	653	654
111	655	656	657	658	659	660
112	661	662	663	664	665	666
113	667	668	669	670	671	672
114	673	674	675	676	677	678
115	679	680	681	682	683	684
116	685	686	687	688	689	690
117	691	692	693	694	695	696
118	697	698	699	700	701	702
119	703	704	705	706	707	708
120	709	710	711	712	713	714
121	715	716	717	718	719	720
122	721	722	723	724	725	726
123	727	728	729	730	731	732
124	733	734	735	736	737	738
125	739	740	741	742	743	744
126	745	746	747	748	749	750
127	751	752	753	754	755	756
128	757	758	759	760	761	762
129	763	764	765	766	767	768
130	769	770	771	772	773	774
131	775	776	777	778	779	780
132	781	782	783	784	785	786
133	787	788	789	790	791	792
134	793	794	795	796	797	798
135	799	800	801	802	803	804
136	805	806	807	808	809	810
137	811	812	813	814	815	816
138	817	818	819	820	821	822
139	823	824	825	826	827	828
140	829	830	831	832	833	834
141	835	836	837	838	839	840
142	841	842	843	844	845	846
143	847	848	849	850	851	852
144	853	854	855	856	857	858
145	859	860	861	862	863	864
146	865	866	867	868	869	870
147	871	872	873	874	875	876
148	877	878	879	880	881	882
149	883	884	885	886	887	888
150	889	890	891	892	893	894
151	895	896	897	898	899	900
152	901	902	903	904	905	906
153	907	908	909	910	911	912
154	913	914	915	916	917	918
155	919	920	921	922	923	924
156	925	926	927	928	929	930
157	931	932	933	934	935	936
158	937	938	939	940	941	942
159	943	944	945	946	947	948
160	949	950	951	952	953	954
161	955	956	957	958	959	960
162	961	962	963	964	965	966
163	967	968	969	970	971	972
164	973	974	975	976	977	978
165	979	980	981	982	983	984
166	985	986	987	988	989	990
167	991	992	993	994	995	996
168	997	998	999	1000		

: COORDINATES FIRST LINE

: MASK

: BIT IS SET

: POSITION CURSOR

: PRINT SCAN LINE

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



SYMBOL TABLE

BFOOT	000234R	BLANK	000220R	CHOUT = ***** G	DTYPE	000000R	002	ERASE = ***** G	
HONE	= ***** G	IF	000216R	IFLOT = ***** G	IX	000212R		IY	000214R
OUTBUF	000232R	PC	=X000007	PCALL	R0	=X000000		R1	=X000001
R2	=X000002	R3	=X000003	R4	R5	=X000005		SBUF	000034R
SCNDSF	0000000R	SOURCE	000000R	SP	SRCHTP	000002R		SX1	000020R
SX3	000026R	SYMBOL	000222R	SY1	SY2	000030R		SZ1	000024R
SZ2	000032R	TBUF	001034R	TX1	TX2	000004R		TY1	000006R
TY2	000014R	TZ1	000010R	TZ2		000016R			
. AHS.	000000		000						
BSFCOH	000002		001						
SCNCOH	000002		002						
SCNCOH	000034		003						
EMERG3 DETECTED: *									
FILE CORE: 17032. WORDS									

.DK1:SCNDSF/N:TTM/E:LC=SCNDSF

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524
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58	000214	122500	10:	CMFB	(R5)+,R0		
59	000216	003007		BCT	SE2CF		;CHECK UPPER LIMIT
60	000220	077203		SOB	R2,18		
61				ALL WITHIN WINDOW			
62	000222	126427	SE2CNF: 000001	CMFB	TWNT-1(R4),#1		;CHECK FOR POSITIVE WINDOW
63	000230	001054		BNE	SE4		
64	000232	000167	177576	JMP	SORSE1		
65				SOME OUT OF WINDOW			
66	000236	126427	SE2CF: 000001	CMFB	TWNT-1(R4),#1		;CHECK FOR POSITIVE WINDOW
67	000244	091446		BEQ	SE4		
68	000246	000167	177562	JMP	SORSE1		
69	000252	000207		RTS	PC		
70	000254			SAVE	10		
71	000260	011600		MOV	(SP),R0		;GET ONE LESS THAN Y LOW
72	000262	005300		DEC	R0		
73	000264	122500		CMFB	(R5)+,R0		;PROCESS FRONT SURFACE WINDOW
74	000266	002403		BLT	18		
75	000270	116500	177777	MOV	-1(R5),R0		
76	000274	010301		MOV	R5,R1		;R1 IS ADDRESS OF PEAK
77	000276	077206		SOB	R2,FSWIND		
78	000300	005301		DEC	R1		;OVERSHOT BY ONE
79				WE NOW HAVE PEAK & LOCATION OF IT			
80	000302	020026		CMFB	R0,(SP)+		;CHECK Y LOW
81	000304	002410		BLT	28		
82	000306	162601		SUB	(SP)+,R1		;SUBTRACT LOW X ADDRESS
83	000310	016700	000254	MOV	TEMP,R0		;GET WINDOW LENGTH (WORDS)
84	000314	006200		ASR	R0		
85	000316	160100		SUB	R1,R0		
86	000320	160067	000416	SUB	R0,TWOFFS		;GET DISTANCE FROM CENTER(NEGATIVE)
87	000324	000750		BR	OUT1		;ADJUST OFFSET
88	000326	012601		MOV	(SP)+,R1		
89	000330	000746		BR	OUT1		
90	000332			PIWIND: SAVE			
91	000334	011600		MOV	(SP),R0		;GET ONE LESS THAN Y LOW
92	000336	005300		DEC	R0		
93	000340	122500		CMFB	(R5)+,R0		
94	000342	002402		BLT	28		
95	000344	116500	177777	MOV	-1(R5),R0		;GET NEW HIGH
96	000350	077203		SOB	R2,18		
97	000352	020026		CMFB	R0,(SP)+		;CHECK Y LOW
98	000354	002734		BLT	OUT1		
99	000356	020023		CMFB	R0,(R3)+		;CHECK Y HIGH
100	000360	003332		BCT	OUT1		
101	000362	012704	SE4: POINT: 001034	MOV	#TRUEF,R4		
102	000366	026727	000002	CMFB	SRCHTP,#1		
103	000374	001402		BEQ	18		
104	000376	012704	000034	MOV	#SBUF,R4		
105	000402	016700	002052	MOV	NCDR+2,R0		;GET Y VALUE
106	000406	005267	000074	INC	THXCD		;SET FLAG FOR RECORD
107	000412	166700	002070	SUB	YLIM1,R0		
108	000416	103715		BLO	OUT		
109	000420	070027	000100	NUL	#64,R0		
110	000424	016702	002074	MOV	YLIM2,R2		
111	000430	166702	002070	SUB	YLIM1,R2		
112	000434	071002		DIV	R2,R0		
113	000436	020027	000100	CMFB	R0,#64		
114	000442	003303		BCT	OUT		

```

115 000444 002402
116 000446 012700
117 000452 000077
118 000454 000077
119 000460 006300
120 000462 006300
121 000464 006300
122 000466 000004
123 000470 016700
124 000474 166700
125 000500 103664
126 000502 070027
127 000506 016702
128 000512 166702
129 000516 071002
130 000520 020027
131 000524 003252
132 000526 002402
133 000530 012700
134 000534 010001
135 000536 003000
136 000540 071027
137 000544 006300
138 000546 000004
139 000550 003401
140 000552 062701
141 000556 012700
142 000562 072001
143 000564 030014
144 000566 000631
145 000570 000000
146 000572 000000
147
148
149 000262
150 000362
151
152 000416
153
154
155 000034
156
157 000000
158 000002
159 000004
160 000006
161 000010
162 000012
163 000014
164 000016
165 000020
166 000022
167 000024
168 000026
169 000030
170 000032
171 000034

59
#63.,R0
R0
#63.,R0
R0
R0
R0,R4
NCDR,R0
XLIN1,R0
OUT
#64.,R0
XLIN2,R2
XLIN1,R2
R2,R0
R0,#64.
OUT
68
#63.,R0
R0,R1
R0
#16.,R0
R0
R0,R4
R0,R4
R1
#15.,R1
#1,R0
R1,R0
R0,(R4)
OUT
0
TEMP: .WORD 0
TEMP1: .CSECT DSPCON
        .BLKW 262
TWND: .BLKW 32
TWNDT: .BLKW 8
TWOFFS: .BLKW 10
        .WORD 0
        .CSECT IBUF
        .BLKW 14
        .BLKW 2048.
        .CSECT SCNCON
        .WORD 0
SOURCE: .WORD 0
SRCHTP: .WORD 0
TX1: .WORD 0
TY1: .WORD 0
TZ1: .WORD 0
TY2: .WORD 0
TZ2: .WORD 0
SX1: .WORD 0
SY1: .WORD 0
SZ1: .WORD 0
SX2: .WORD 0
SY2: .WORD 0
SZ2: .WORD 0
SBUF: .BLKW 256.

; CONVERT Y TO BUFFER INDEX
; Y POSTION SET
; GET X
; X WORD SET
; PLACE BIT IN BUFFER
; TIME WINDOWS
; TIME WINDOW TYPES

```

172	001034	000000
173	002034	000000
174	002036	000000
175	002040	000000
176	002042	000000
177	002044	000000
178	002046	000000
179	003050	000000
180	002066	000000
181	002070	000000
182	002072	000000
183	002074	000000
184		000000
185		000000
186	000074	000000
187		000001

TBUF:	.BLKW	256.
STATUS:	.WORD	0
XD IR:	.WORD	0
YD IR:	.WORD	0
XP NT:	.WORD	0
YP NT:	.WORD	0
ZP NT:	.WORD	0
NC DR:	.BLKW	7
XL I N1:	.WORD	0
XL I N1:	.WORD	0
XL I N2:	.WORD	0
YL I N2:	.WORD	0
	CSECT	RCDKCK
THX CD:	.BLKW	30.
	.WORD	0
	.END	

**THRESHOLD EXCEEDED FLAG**

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

## SYMBOL TABLE

```

FSW      000254R
OUT1     000246R
R1       =X0000001
SDUF     000034N
SE2B     000162R
SOURCE   0000026R
SX3      0000026R
TUUF     001034R
TWD1T    000362R
TY2      000014R
XL1M2    002072R
YPNT     002044R
. ABS.   0000000
          000574
DSPCOM   000420
IBUF     010034
SCNCON   002076
RCINCON  00C976
          ERRORS DETECTED
          FREE CORE: 1692

```

**DK1:SEARCH/N:TTM/E:LC=SEARCH**

**C-126**

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

.TITLE STUBS
.CLOBL XDUCER
.MCALL .REGDEF
.REGDEF

```

RTS PC  
END

## PRODUCER:

ॐ नमो भगवते वासुदेवाय

4 000000  
5 000000  
6 000000

1000000  
2000000

RT-11 MACRO VMD2-12 21-NOV-79 PAGE 1

SYMBOL TABLE

PC =X000007 R0 =X000000 R1 =X000001 R2 =X000002 R3 =X000003

R4 =X000004 R5 =X000005

. AFS. 000000 000  
000002 001

ERRORS DETECTED: 0  
FREE CORE: 17291. WORDS

.DK1:STUBS/N:TTN/E:LC=STUBS

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**C-130**

SYMBOL TABLE

C = 006400  
 ERASE = \*\*\*\*\* G  
 IN 000172R  
 NUM1 = 000034  
 R1 = 0000001  
 SP = 0000000  
 TLEVS 000016R 003  
 . ABS. 000000 000  
 001046 001  
 TEKCON 000072 002  
 ATPARA 000004 003  
 ERRORS DETECTED: 0  
 FREE CORE: 16000. WORDS  
 .DK1: TC/N: TTM/E: LC=TC

CHOUT = \*\*\*\*\* G  
 F = 000000  
 L = 000000  
 PC = 0000007  
 R3 = 0000002  
 SSL 000446R  
 TLEV1 000022R 003

CSL  
 H1  
 LO  
 PSL  
 R3  
 TC  
 TLEV2 003

000534R  
 000250R  
 000252R  
 000652R  
 -0000003  
 0000000G  
 000026R

ISP  
 HOME  
 LSL  
 R  
 R4  
 TOUT  
 TLOP 003

000254R  
 = \*\*\*\*\* G  
 000772R  
 = 000000  
 -0000004  
 000032R  
 000046R

END  
 ICEBUP  
 NUM  
 R0  
 R5  
 TCR  
 TSMC  
 001044R  
 000000R  
 000002  
 -0000000  
 -0000000  
 000274R  
 000000R  
 003  
 003  
 003

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR



```

51 000146 012701 000006      *6,R1
52 000152 000167 000104      DOIO
53 000156
54 000156 010046
55 000160 010146
56 000162 012700 000114
57 000166 012701 000002      *R1, -(SP)
58 000172 000167 000064      *BUF1+6,R0
59 000176 000000 000206      *2,R1
000210 000000 000212      DOIO
000212 000000 000212      *WORD 0,BUF2+10,BUF2+12,BUF2+14,0,767..0
000212 000000
60
61
62 000214
63 000214 010546
64 000216 012700 000176
65 000222 004767 000066      *R3, -(SP)
66 000226 004767 177614      *BUF2,R5
67 000232 012606 000064      PC, IPLOT
68 000234 000207 000000      PC, ALPHA
69 000236 007 000 000      (SP)+,R5
000241 000 000      PC
000241 000 000      .BYTE 7,0,0,0
70
71
72 000242
73 000242 010046
74 000244 010146
75 000246 012700 000236
76 000252 012701 000004      *R0, -(SP)
77 000256 000167 000000      *R1, -(SP)
000262 000167 000000      *BUF3,R0
000262 100737 173614      *4,R1
000266 100376 173616      DOIO
000270 112037
000274 077106
000276 012601
000280 012606
000302 000207
000304 000000
000306
80
81 000270 112037
82 000274 077106
83 000276 012601
84 000280 012606
85 000302 000207
86 000304 000000
87 000306
88
89
90
91
92
93
94 000314
95 000314 010046
96 000316 010146
97 000320 010346
98 000322 010446
99 000324 012704 000313
000324 012704 000004      *R0, -(SP)
000330 012767 000001      *R1, -(SP)
000336 012746 000001      *R3, -(SP)
000342 017500 000002      *R4, -(SP)
000346 010001 000001      *BUF5,R4
000346 010001 177746      *4,LEN
000346 010001 176937      *1, -(SP)
000346 010001 176937      *2(R5),R0
000346 010001 176937      *R0,R1
000346 010001 176937      *176937,R0

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS 100%

105	000354	012703	000005	MOV	#5,R3
106	000360	006200		ASR	R0
107	000362	077302		SOB	R3,20
108	000364	052700	000040	BIS	#40,R0
109	000370	042701	177740	BIC	#177740,R1
110	000374	052701	000100	BIS	#100,R1
111	000400	005716		TST	(SP)
112	000402	100002		BPL	50
113	000404	052701	000040	BIS	#40,R1
114	000410	110144		MOV	R1,-(R4)
115	000412	110044		MOV	R0,-(R4)
116	000414	005716		TST	(SP)
117	000416	100405		BMI	100
118	000420	005416		NEG	(SP)
119	000422	017500	000004	MOV	@4(R5),R0
120	000426	000167	177714	JMP	10
121	000432	017500	000006	MOV	@6(R5),R0
122	000436	001004		BNE	200
123	000440	005267	177640	INC	LEN
124	000444	112744	000035	MOV	#37,-(R4)
125	000450	016700	177630	MOV	L,M,R0
126	000454	105737	175614	TSTB	#CSR
127	000460	100375		BPL	200
128	000462	112437	175616	MOV	(R4)+,@DATA
129	000466	077006		SOB	R0,250
130	000470	005726		TST	(SP)+
131	000472	012604		MOV	(SP)+,R4
132	000474	012003		MOV	(SP)+,R3
133	000476	012601		MOV	(SP)+,R1
134	000500	012600		MOV	(SP)+,R0
135	000502	000207		RTS	PC
136					OUTPUT ASCII CHARACTERS
137					CALL CHOUT(1BUF)
138					1BUF=N,ARRAY OF CHARACTERS
139					N=NUMBER OF CHARACTERS TO BE OUTPUT
140	000504	004767	177336	JSR	PC,ALPHA
141	000510	010046		MOV	R0,-(SP)
142	000512	010146		MOV	R1,-(SP)
143	000514	016500	000002	MOV	2(R5),R0
144	000520	063700	000002	ADD	#2,R0
145	000524	017501	000002	MOV	@2(R5),R1
146	000530	000167	177526	JMP	DOIO
147	000534	000000			WORD
148	000536				BLKW
149					PRINT VERTICAL LABEL OR HORIZONTAL DOUBLE SPACED LABEL
150					CALL PRTH(1BUF,N)
151					CALL PRTH(1BUF,N)
152					1BUF=CHARACTER BUFFER
153					N=NUMBER OF CHARACTERS
154	000652	010046		MOV	R0,-(SP)
155	000654	010146		MOV	R1,-(SP)
156	000656	010246		MOV	R2,-(SP)
157	000660	012767	005010	MOV	#5010,CHS
158	000666	000167	000014	JMP	OUT
159	000672	010046		MOV	R0,-(SP)
160	000674	010146		MOV	R1,-(SP)
161	000676	010246		MOV	R2,-(SP)

```

152 000700 012767 000040 177626 MOV #40,CRS
153 000706 004767 177154 JSR PC,ALPHA2
154 000712 017500 000004 MOV #4(R5),R0
155 000716 012762 000536 MOV #PRDF,R2
156 000722 016501 000002 MOV 2(R5),R1
157 000726 112122 MOV (R1)+(R2)+
158 000730 116722 177600 MOV CHS,(R2)+
159 000734 116722 177575 MOV CHS+1,(R2)+
160 000740 077006 SOB R0,L10
161 000742 017501 MOV #4(R5),R1
162 000746 070127 MUL #3,R1
163 000752 012602 MOV (SP)+,R2
164 000754 012700 MOV #PRDF,R0
165 000760 005267 INC LBLUP
166 000764 000167 JMP DO10
167 000770 005267 INC WTSE
168 000774 000002 RTI
169 000776 000000 PSTAT: .WORD 0
170 000776 000000 INTLOC: .WORD 0
171 001000 000000 ; ALLOW GRAPHIC INPUT FROM JOYSTICK
172 001000 000000 ; CALL GRIN(IALPHA,IX,IY)
173 001000 000000 ; PLACES GRAPHIC CROSSHAIR ON SCREEN
174 001000 000000 ; COORDINATE IS TRANSMITTED WHEN ANY KEYBOARD CHARACTER IS ENTERED
175 001000 000000 ; RETURNS: IALPHA=KEYBOARD CHARACTER
176 001000 000000 ; IX,IY=SCREEN COORDINATES 0-1024
177 001000 000000
178 001000 000000
179 001000 000000
180 001000 000000
181 001000 000000
182 001000 000000
183 001000 000000
184 001000 000000
185 001000 000000
186 001000 000000
187 001002 010046 MOV R0,-(SP)
188 001004 010146 MOV R1,-(SP)
189 001006 005067 CLR CBF
190 001012 005067 CLR WTSE
191 001016 052737 BIS #100,@WCSR
192 001024 105737 TSTB @CSR
193 001030 100375 BPL C1
194 001032 112737 MOV #21,@DATO
195 001040 012737 MOV #CINT,@TTV
196 001046 012701 MOV #7,R1
197 001052 012700 MOV #CBF+1,R0
198 001056 003767 TST WTSE
199 001062 001775 BEQ C2
200 001064 113720 MOV #DATI,(R0)+
201 001070 005067 CLR WTSE
202 001074 052737 BIS #100,@WCSR
203 001102 077113 SOB R1,C2
204 001104 012737 MOV #TTINT,@TTV
205 001112 000367 SWAB CBF
206 001116 012701 MOV #2,R1
207 001122 016700 MOV #CBF+2,R0
208 001126 000300 SWAB R0
209 001130 106300 ASLB R0
210 001132 106300 ASLB R0
211 001134 106300 ASLB R0
212 001136 072027 ASH #-3,R0
213 001142 042700 BIC #17600,R0
214 001146 017575 MOV #6(R5),@4(R5)
215 001154 016075 MOV R0,@6(R5)
216 001160 016700 MOV #CBF+4,R0
217 001164 077120 SOB R1,C3
218 001166 016775 MOV #CBF,@2(R5)

```

```

219 001174 026727 000026 000033      CMP      #33 ;CHECK FOR ESCAPE
220 001202 001457          BEQ      ESCAPE
221 001204 162775          SUB      #7,04(R5)
222 001212 003002          BGT      18
223 001214 005075          CLR      04(R5)
224 001220 012601          MOV      (SP)+,R1
225 001222 012600          MOV      (SP)+,R0
226 001224 000207          RTS      PC
227 001236          .BLKW      4
228 001236 000000          .WORD   0
229
230      ; ENABLE UNSOLICITED SINGLE CHARACTER INPUT FROM TERMINAL TO TEKCOM
231      ; COMMON/TEKCOM/ICHBUF
232      ; CALL TEKIN
233 001240 012737 001274' 000370      MOV      #TTINT,0*TTV
234 001246 005037 000372          CLR      0*TTV+2
235 001252 052737 000100 175610      BIS      #100,0*WCSR
236 001260 052737 000200 175614      BIS      #200,0*CSR
237 001272 000207          CLR      ICHBUF
238 001274 113757 175612 000000'      RTS      PC
239 001302 026727 000000' 000033      MOV      0*DATA1,ICHBUF
240 001310 001414 000000' 000033      CMP      ICHBUF,#33
241 001312 026727 000000' 000021      BEQ      ESCAPE
242 001320 026727 000000' 000021      CMP      ICHBUF,#21
243 001322 026727 000000' 000022      BEQ      STOP
244 001330 052737 000000' 000022      CMP      ICHBUF,#22
245 001332 052737 000100 175610      BEQ      STOP
246 001340 000002 000100 175610      BIS      #100,0*WCSR
247 001342 012767 000110 000000'      TTINT:  #110,ICHBUF
248 001350 012667 177424          ESCAPE:  (SP)+,INTLOC
249 001354 012667 177416          MOV      (SP)+,PSTAT
250 001360 012706 001000          MOV      #STRBASE,SP
251 001364 016746 177406          MOV      PSTAT,-(SP)
252 001370 012746 000000G          MOV      #CNTCAL,-(SP)
253 001374 000756          BR      TTNT1
254 001376 005767 002166'          STOP:   COMIP  ;CHECK COMMUNICATION IN PROGRESS
255 001402 001022          BNE      TTNT2
256 001404 005737 167740          TST      0*167740
257 001410 002417          BLT      TTNT2
258 001412 010046          MOV      R0,-(SP)
259 001414 012767 000005 002076'      MOV      #5,COMAND
260 001422 012700 000001          MOV      #1,R0
261 001426 026727 000000' 000021      CMP      ICHBUF,#21
262 001434 001402          BEQ      18
263 001436 005067 002076'          CLR      COMAND
264 001442 004767 000000G          JSR      PC,VRTLS1
265 001446 012600          MOV      (SP)+,R0
266 001450 005067 000000'          CLR      ICHBUF
267 001454 052737 000100 175610      BIS      #100,0*WCSR
268 001462 000002          RTS      RTI
269      .CSECT  SCNCOM
270      . = +2076
271 002076 000000          CONAND:  .WORD   0
272 002166 000000          COMIP:   .BLKW   27.
273 002166 000000          COMIP:   .WORD   0
274 000000 000000'          .CSECT  TEKCOM
275 000000 000000          ICHBUF:  .WORD   0

```

TEKHOD RT-11 MACRO VHS2-12 21-NOV-79 PAGE 1+

276 000002 000000  
277 000001

LBLUP: .WORD 0  
.END

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

ALPHA	000046RG	ALPHA2	000066RG	BELL	000242RG	BUF	000000R	000386R
BUF1	000106R	BUF2	000176R	BUF3	000236R	CHOUT	000504RG	000534R
CHTAL=	***** G	CORAND	002076R	COMIP	002166R	CR	000136RG	000116RG
CSR	= 175614	DAT1	= 175612	DATO	= 175616	DO10	000262R	000222RG
ESCAPE	001342R	CBF	001226R	CINT	000770R	CRIN	001002RG	001024R
G2	001036R	G3	001126R	HOME	000214RG	ICHBUP	000000R	001000R
IFLOT	000314RG	LBLUP	000002R	LEN	000304R	LP	000156RG	000116RG
L16	000726R	OUT	000706R	PC	0000007	PRBF	000536R	000472RG
PRTV	000652RG	PSTAT	000776R	R0	=X000000	R1	=X000001	=X000002
R3	=X000003	R4	=X000004	R5	=X000005	SP	=X000006	STBASE= 001000
STOP	001376R	TEKIN	001240RG	TTINT	001274R	TTNT1	001332R	TTNT2
TTV	= 000370	WISR	= 175610	VRTLS1=	***** G	WISE	001236R	001400R

. ABS. 000000 000  
001464 001  
SCNCOM 002170 002  
TEKCON 000004 003  
ERRORS DETECTED: 0  
FREE CORE: 16974. WORDS

.DK1:TEKMOD/N:TTM/E:LC=TEKMOD

```

1  .TITLE TWINDO
2  .GLOBL TWINDO, WINT, CHOUT
3  .GLOBL HOME, PLTW
4  .MCALL SAVE, UNSAVE, CHTXT, CRSTUP, SUPTXT, .RECDEF
5  .REGDEF
6  TWINDO: SAVE 012345
7  ADD WINDO OFFSET
8  MOV #16, R0
9  MOV #TWIND, R1
10 MOV #TWOFFS, R2
11 ASR R2, (R1)+
12 TST (R1)+
13 SOB R0, 15
14 CLR TWOFFS
15 MOV #8, R0
16 MOV #TWINDT, R1
17 MOV #TWIND, R2
18 MOV #XWL, R3
19 MOV (R2)+, (R3)+
20 MOV (R2)+, (R3)+
21 MOV (R2)+, (R3)+
22 MOV (R2)+, (R3)+
23 MOV (R2)+, (R3)+
24 MOV (R1)+, (R3)+
25 CLRB
26 JSR PC, PLTW
27 SOB R0, 15
28 MOV #WNSC, R5
29 JSR PC, HOME
30 JSR PC, CHOUT
31 MOV #WCALL, R5
32 JSR PC, WINT
33 MOV STA1, R0
34 JNP @JNP(R0)
35 GWIND, DELETE, OUT
36 MOV WCHAR, R0
37 CHP R0, #106
38 BEQ FSWIND
39 CNP R0, #104
40 BEQ FIXDSP
41 CNP R0, #122
42 BEQ RWIND
43 CNP R0, #124
44 BEQ TWIND
45 CNP R0, #120
46 BEQ PIVIND
47 CNP R0, #100
48 BEQ PTRW
49 CNP R0, #55
50 BNE OUT
51 MOV #2, R0
52 BR PT1
53 MOV #1, R0
54 MOV #5, R1
55 TSTB TWINDT-1(R1)
56 BEQ 25
57 SOB R1, 15

```

; 16 X COORDINATES  
 ; PREPARE TO PLAT 8 WINDOWS  
 ; R1 POINTS TO WINDO TYPE  
 ; R2 POINTS TO COORDINATES  
 ; PLOT WINDOWS  
 ; GET COORDINATE  
 ; GET COORDINATE  
 ; GET COORDINATE  
 ; GET WINDOW TYPE  
 ; CLEAR UPPER NBYTE  
 ; PLOT WINDOW  
 ; PUT UP MESSAGE  
 ; INPUT NEW WINDOW  
 ; CHECK INPUT STATUS  
 ; CHECK FOR 'F'  
 ; CHECK FOR 'D'  
 ; CHECK FOR 'R'  
 ; CHECK FOR 'T'  
 ; CHECK FOR 'P'  
 ; CHECK FOR 'O'  
 ; CHECK FOR 'I'  
 ; TYPE 2 WINDOW REQUESTED  
 ; TYPE 1  
 ; LOOK FOR UNUSED WINDO

58	000254	000722	BR	MOV	TVI	NO WINDOW AVAILABLE
59	000256	110051	MOV	R0, TWINDT-1(R1)	SET WINDO TYPE	
60	000262	010067	MOV	R0, WTP		
61	000266	072127	ASH	#3, R1		
62	000272	000291	ADD	*TWIND-8., R1		
63	000276	013700	MOV	*XVL, R0		
64	000302	012021	MOV	(R0)+, (R1)+	PUT COORDINATE IN WINDOW	
65	000304	012021	MOV	(R0)+, (R1)+	PUT COORDINATE IN WINDOW	
66	000306	012021	MOV	(R0)+, (R1)+	PUT COORDINATE IN WINDOW	
67	000310	012021	MOV	(R0)+, (R1)+	PUT COORDINATE IN WINDOW	
68	000312	004767	JSR	PC, PLTW	PLOT WINDOW	
69	000316	000701	BR	TVI	GET NEXT INPUT	
70	000320	005067	CLR	RENT		
71	000324	012767	MOV	*-1, RENTR2		
72	000332	012767	MOV	543210		
73	000346	000207	RTS	PC		
74	000350	012700	MOV	*6, R0		
75	000354	000731	BR	PT1		
76	000356	012767	MOV	*5, WTP		
77	000364	112767	MOV	*5, TWINDT+5		
78	000372	012701	MOV	*TWIND+<5*8.>, R1		
79	000376	000737	BR	PT2		
80	000400	012767	MOV	*3, WTP	SET WINDOW TYPE	
81	000406	112767	MOV	*3, TWINDT+6		
82	000414	016767	MOV	XVL, RSTART	SET RECORDING LIMITS	
83	000422	016767	MOV	XVL, RSTOP		
84	000430	012701	MOV	*TWIND+<6*8.>, R1		
85	000434	000720	BR	PT2	INSERT AND PLOT WINDOW	
86	000436	012767	MOV	*4, WTP	SET WINDOW TYPE	
87	000444	112767	MOV	*4, TWINDT+7		
88	000452	012701	MOV	*TWIND+<7*8.>, R1		
89	000456	000707	BR	PT2	GET WINDOW & PLOT IT	
90	000460	016767	MOV	XVL, RSTARTX	CHANGE LIMITS OF DISPLAY	
91	000466	016767	MOV	XVL, RSTOPX		
92	000474	000716	BR	OUT1		
93	000476	012704	MOV	*8., R4	SEARCH 6 WEINDOMS	
94	000502	116403	MOV	TWINDT-1(R4), R3	GET WINDOW TYPE	
95	000506	001423	BEQ	DIE	IF TYPE ZERO (UNUSED) . TRY AGAIN	
96	000510	010367	MOV	R3, WTP	STORE WINDOW TYPE	
97	000514	010403	MOV	R4, R3		
98	000516	072327	ASH	*3, R3	MULTIPLY BY 8	
99	000522	062703	ADD	*TUND-8., R3	ADD WINDOW OFFSET	
100	000526	022367	CHF	(R3)+, PNT	CHECK XVL AGAINST X	
101	000532	003011	BCT	DIE		
102	000534	022367	CNP	(R3)+, PNT+2	CHECK AGAINST Y	
103	000540	003006	BCT	DIE		
104	000542	022367	CNP	(R3)+, PNT	CHECK XVL AGAINST X	
105	000546	002403	BLT	DIE		
106	000550	022367	CNP	(R3)+, PNT+2	CHECK YVL AGAINST Y	
107	000554	003003	BCT	D3		
108	000556	077427	SOB	R4, D1	TRY ANOTHER WINDOW	
109	000560	000167	JNP	TVI	NO FIND, GET WINDOW	
110	000564	010403	MOV	R4, R3		
111	000566	072327	ASH	*3, R3		
112	000572	062703	ADD	*TUND-8., R3	GET WINDOW ADDRESS	
113	000576	012702	MOV	*XVL, R2	ADDRESS TO SEND DATA TO PLTW	
114	000602	012322	MOV	(R3)+, (R2)+	TRANSFER WINDOW	

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

**C-142**

BLKNUH	000006R	003	CHOUT = ***** C	000114R	003	DELETE	000476R	003	DELTA	001354R	005
DTYPE	000000R	004	D1	000502R	000556R	D2	000560R	005	D3	000564R	005
D4	000616R	005	D6	000632R	000602R	FIXDSP	000460R	005	FSTART	010016R	004
F7TOP	010020R	005	FSVIND	000356R	010024R	GWIND	000150R	004	HONE = ***** G	000004R	004
IACT	010026R	005	ICHBUF	000000R	000000R	IEXIT	010034R	005	MAXX	000000R	004
MAXY	000010R	004	MD	010006R	000002R	IREPT	000002R	004	MINY	000000R	004
NUH = 000001			MDATA	000000R	000002R	MINX	000002R	004	OUT1	000332R	004
PC = 0000007			ORPTR	000000R	000002R	OUT	000002R	005	PNT	000372R	005
PTIV	000234R	005	PLTW	000350R	000060R	PLTW = ***** G	000000R	003	REXTR	010010R	005
RENTL2	010022R	005	PT2	000240R	000276R	RCHNUN	000400R	005	R0	000000R	004
R1 = 0000001			RSTOP	000142R	000144R	R4 = 0000004	000400R	005	R3	000000R	004
SEPLID	000106R	003	R3	0003002	0000003	R4	0000004	005	STAT	000676R	004
STOPX	010014R	005	SSACT	0000006	010032R	STARTX	010012R	004	TWINDT	000362R	005
THOPPS	000416R	004	TVINDO	000436R	000000R	TWIND	000262R	004	WINT	000000R	004
WJIP	000142R	003	WALL	000122R	000672R	WCHAR	000414R	004	XACT	010030R	004
XMERID	000100R	003	WMSG1	000700R	001354R	WTP	000412R	004	XVH	000406R	004
XVL	000402R	004	XLO	000020R	000016R	XNPTH	000376R	004	YLO	000022R	004
YVH	000402R	004	YHCTH	000012R	000400R	YH1	000024R	004			
. ADS.	000000R	000	Y0	000404R	000014R			004			
TEKCOH	000000R	001									
RACCOH	000002	002									
DEPCOH	000166	003									
NTROCH	000420	004									
NTROCH	010036	005									

C-143  
 EMBERS DETECTED: 0  
 FREE CORE: 16413. WORDS  
 .DK1:TVINDO/N:TTV/E:LC=TVINDO

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR

**C-144**

UNPACK RT-11 MACRO VM02-12 21-NOV-79 PAGE 1+  
SYMBOL TABLE

**IBL: 000034R**

72 2000002

**UNPACK 00000000**

• A123. 000000

**TIME**  
**000106**  
**010034**

**463319 JOMI FLUROS DETECTED:**

**END THE  
FIRE CORE: 17169.**

**THE**

**.BKI: UNPACK/N: TTN/E: LC=UNPACK**

**90007**  
**10007**

118

**SECRET**

22

**50000X =**  
**200000X =**

உதவி

000044PC  
=X000003

**PACK  
123**

**2003**

## References

2

**1991**

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10

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REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

VIEW	SAVE	VIEW:	TITLE	VIEW	GLOBAL VIEW, ERASE, HOME, CHOUT, CRIN	MCALL	CHTXT, CISTUP, SUPTXT, SAVE, UNSAVE, .RECEIVE	RECEIVE
1	000000	010022	TST	012345	RENTT2	0	RENTT2	0
2	000000	000000	REQ	000000	SUBSCH	0	REQ	0
3	000014	000014	BCT	000000	PC, CHOUT	0	BCT	0
4	000020	000020	JSR	000000	PC, CHOUT	0	JSR	0
5	000024	000024	JSR	000000	PC, CHOUT	0	JSR	0
6	000030	000030	CHP	000000	PC, CHOUT	0	CHP	0
7	000034	000034	REQ	000000	PC, CHOUT	0	REQ	0
8	000042	000042	REQ	000000	PC, CHOUT	0	REQ	0
9	000044	000044	REQ	000000	PC, CHOUT	0	REQ	0
10	000048	000048	TST	000000	PC, CHOUT	0	TST	0
11	000052	000052	BLE	000000	PC, CHOUT	0	BLE	0
12	000056	000056	NOV	000000	PC, CHOUT	0	NOV	0
13	000060	000060	JSR	000000	PC, CHOUT	0	JSR	0
14	000064	000064	JMP	000000	PC, CHOUT	0	JMP	0
15	000068	000068	CLR	000000	PC, CHOUT	0	CLR	0
16	000072	000072	CLR	000000	PC, CHOUT	0	CLR	0
17	000076	000076	CHP	000000	PC, CHOUT	0	CHP	0
18	000080	000080	REQ	000000	PC, CHOUT	0	REQ	0
19	000084	000084	CHP	000000	PC, CHOUT	0	CHP	0
20	000088	000088	REQ	000000	PC, CHOUT	0	REQ	0
21	000092	000092	REQ	000000	PC, CHOUT	0	REQ	0
22	000096	000096	REQ	000000	PC, CHOUT	0	REQ	0
23	000100	000100	REQ	000000	PC, CHOUT	0	REQ	0
24	000104	000104	REQ	000000	PC, CHOUT	0	REQ	0
25	000108	000108	REQ	000000	PC, CHOUT	0	REQ	0
26	000112	000112	REQ	000000	PC, CHOUT	0	REQ	0
27	000116	000116	REQ	000000	PC, CHOUT	0	REQ	0
28	000120	000120	REQ	000000	PC, CHOUT	0	REQ	0
29	000124	000124	REQ	000000	PC, CHOUT	0	REQ	0
30	000128	000128	REQ	000000	PC, CHOUT	0	REQ	0
31	000132	000132	REQ	000000	PC, CHOUT	0	REQ	0
32	000136	000136	REQ	000000	PC, CHOUT	0	REQ	0
33	000140	000140	REQ	000000	PC, CHOUT	0	REQ	0
34	000144	000144	REQ	000000	PC, CHOUT	0	REQ	0
35	000148	000148	REQ	000000	PC, CHOUT	0	REQ	0
36	000152	000152	REQ	000000	PC, CHOUT	0	REQ	0
37	000156	000156	REQ	000000	PC, CHOUT	0	REQ	0
38	000160	000160	REQ	000000	PC, CHOUT	0	REQ	0
39	000164	000164	REQ	000000	PC, CHOUT	0	REQ	0
40	000168	000168	REQ	000000	PC, CHOUT	0	REQ	0
41	000172	000172	REQ	000000	PC, CHOUT	0	REQ	0
42	000176	000176	REQ	000000	PC, CHOUT	0	REQ	0
43	000180	000180	REQ	000000	PC, CHOUT	0	REQ	0
44	000184	000184	REQ	000000	PC, CHOUT	0	REQ	0
45	000188	000188	REQ	000000				

```

50 000343 012767 177777 010022*
51 000350 000167 000076
52 000354 004767 000000C
53 000360 012703 001233*
54 000364 004767 000000C
55 000370 016767 000020*
56 000376 016767 000026*
57 000404 016767 000022*
58 000412 016767 000027*
59 000420 012704 000043*
60 000424 004767 000040
61 000430 012767 000003 000002*
62 000436 012767 000003 000034*
63 000444 012767 177777 010022*
64 000452 000207
65 000466 000207
66 000470 012703
67 000474 004767
68 000500 026767
69 000506 101407
70 000510 016700
71 000514 016767
72 000522 010067
73 000526 026767
74 000534 101407
75 000536 016700
76 000542 016767
77 000550 010067
78 000554 016700
79 000560 166700
80 000564 162767
81 000572 070067
82 000576 071027
83 000602 066700
84 000606 010024
85 000610 016700
86 000614 166700
87 000620 070067
88 000624 071027
89 000630 066700
90 000634 010014
91 000636 012705
92 000642 004767
93 000646 00000C
94 000650 000003
95 000656 000664*
96 000660 000000
97 000662 000000
98 000664 000000
99 000666
100 000734
101 000772
102 001030
103 01070
104 01116
105 001202
106 001232

```

;REQUEST INPUT POINT SCAN COORDINATE  
 ;SET UP FOR POINT SCAN  
 ;GET X,Y INPUT  
 ;ORDER LIMITS  
 ;CONVERT X COORDINATE  
 ;CONVERT Y COORDINATE  
 ;ECHO "+."

;--1,RENTN2  
 OUT  
 PC,RCNE  
 ;QNSC,R3  
 PC,CHOUT  
 SX1,XL1N1  
 SX2,XL1N2  
 SY1,YL1N1  
 SY2,YL1N2  
 ;XPTN,R4  
 PC,PTIN  
 ;3,SRCHTP  
 ;2,STATUS  
 ;--1,RENTN2  
 643210  
 PC  
 ;GCALL,R5  
 PC,GRIN  
 XL1N1,XL1N2  
 18  
 XL1N2,R0  
 XL1N1,XL1N2  
 R0,XL1N1  
 YL1N1,YL1N2  
 28  
 YL1N2,R0  
 YL1N1,YL1N2  
 R0,YL1N1  
 XL1N2,R  
 XL1N1,R  
 ;100,IX  
 IX,R0  
 ;768,R0  
 XL1N1,R0  
 R0,(R4)+  
 YL1N2,R0  
 YL1N1,R0  
 IY,R0  
 ;768,R0  
 YL1N1,R0  
 R0,(R4)  
 ;PLUS,R5  
 PC,CHOUT  
 PC  
 3,IALPHA,IX,IY  
 0  
 0  
 0  
 EMSG,MSG,<PRIMARY SCAN NOT DEFINED>  
 MSG,MSG,<SELECT VIEW NAME>  
 CHOUT <0-DEFINE NEW SUB SCAN >  
 CHOUT <1-DEFINE NEW POINT SCAN >  
 MSG,MSG,<SUB SCAN>  
 CHOUT <USING CURSOR SELECT OPPOSITE CORNERS OF SCAN>  
 CHOUT <PRESS RETURN TO ENTER COORDINATE>  
 MSG,PLUS,<POINT SCAN>

;WORD  
 ;WORD  
 ;WORD  
 SUPTXT  
 SUPTXT  
 SUPTXT  
 CHOUT  
 CHOUT  
 SUPTXT  
 CHOUT  
 CHOUT  
 SUPTXT  
 CHOUT  
 CHOUT  
 SUPTXT

;GCALL: 000662\*  
 IALPHA:  
 IX:  
 IY:

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REPRODUCIBILITY OF THIS  
ORIGINAL PAGE IS POOR

WINT RT-11 MACRO VM02-12 21-NOV-79 PAGE 1+

114 000414 000000  
115 000001

WCHAR: .WORD 0  
.END

;CHARCHATER INTERES WITH FIRST WINDOW POINT

WINT RT-11 NACRO VMD2-12  
SYMBOL TABLE

[illegible]

. ABS. 000000 000  
NTTCOM 000436 001  
010036 002  
BSPCOH 000416 003  
ERRORS DETECTED: 0  
FBI CORE: 16272. WORDS

**.DK1:WINT/N:TTM/E:LC=WINT**

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

1 1
2 2
3 3
4 4 000000
5 5 000000
6 6 000000
7 7 000012 016702 000142
8 8 000016 005067 000106
9 9 000024 116267 000034 000100
10 10 000030 016702 000076
11 11 000034 032702 000001
12 12 000036 001403
13 13 000040 005022
14 14 000044 005267 000076
15 15 000050 012701 000126
16 16 000054 020267 000136
17 17 000056 002406
18 18 000062 012705 000116
19 19 000066 004767 000000
20 20 000072 016702 000076
21 21 000074 013122
22 22 000074 029127 000142
23 23 000100 003763
24 24 000102 010267 000076
25 25 000106
26 26 000114 000207
27 27 000116 000000
28 28 000122 000000
29 29 000124 000000
30 30 000126 000122 002050 002052
31 31 000134 000122 000144 000416
32 32 000142 000124 000142 000124 000000
33 33 000076 000000
34 34 000114 000001
35 35 000136 000000
36 36 000136 000000
37 37 000142 000000
38 38 000144 000000
39 39 000144 000000
40 40 000166
41 41 000166 000000
42 42
43 43 000034
44 44 000034 000000
45 45
46 46 010012 000000
47 47 010012 000000
48 48 010014 000000
49 49 000000
50 50 002050
51 51 002050 000000
52 52 000416
53 53 000000
54 54 000416 000000
55 55

```

.TITLE WPH  
 .GLOBL WPH, WRTHUF  
 .MCALL SAVE, UNSAVE, .RECDEF  
 .RECDEF  
 .SAVE  
 MOV 012  
 RSTRT, R2  
 STVAL  
 IBUF(R2), STVAL  
 ORPNTR, R2  
 #1, R2  
 30  
 (R2)+  
 ORPNTR  
 #FROM, R1  
 R2, BUFEND  
 20  
 #CALL, R5  
 PC, WRTHUF  
 ORPNTR, R2  
 0(R1)+, (R2)+  
 R1, #FROM+12.  
 10  
 R2, ORPNTR  
 210  
 UNSAVE  
 RTS  
 PC  
 1.0  
 .WORD  
 ZER:  
 .WORD  
 .WORD  
 .WORD  
 ZER, NCDR, NCDR+2, RSTRT, RSTOP, TWOFFS, STVAL  
 .CSECT  
 .BLKW 31.  
 .WORD 0  
 .BLKW 6  
 .BLKW 1  
 .WORD 1  
 .BLKW 8.  
 .WORD 0  
 .BLKW 1.  
 .WORD 0  
 .WORD 0  
 .BLKW 8.  
 .BLKW 2048.  
 .CSECT IBUF  
 .BLKW 14.  
 .BLKW 14.  
 .BLKW 2048.  
 .CSECT NTRCON  
 .BLKW 2053.  
 .WORD 0  
 .WORD 0  
 .CSECT SCNCON  
 .BLKW 532.  
 .BLKW 7  
 .CSECT DSPCON  
 .WORD 0  
 .END  
 .TIME WINDOW OFFSET

WPH RT-11 MACRO VMD2-12 21-NOV-79 PAGE 1+

SYMBOL	TABLE	002	CMFTYP	000114R	002	FROM	000126R	IBUF	000034R	003	NCBR	002030R	005
BUFEND	000136R	002	OUTBUF	000166R	002	PC	=X000007	RSTART	000142R	002	RSTUF	000144R	002
OUTPTR	000076R	002	R1	=X000001	002	R2	=X000002	R3	=X000003	002	R4	=X000004	002
RU	=X000000		SP	=X000006		STARTX	010012R	STOPX	010014R	004	STVAL	000124R	
R5	=X000005		WCALL	000116R		WPH	00000000	WRTBUF	***** C	004	ZER	000122R	
TWOFFS	000416R	006											
. ABS.	000000	000											
	000144	001											
RCDCOM	004166	002											
IRUF	010034	003											
NTMCOM	010016	004											
SCHCOM	002066	003											
DSPCOM	000420	006											
ERRORG DETECTED:	0												
FREE CORE:	17069. WORDS												
. DKL: WPH/N: TTB/E: LC=WPH													

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



61 000066	000000	BLKNUM:	.WORD	0	;	CURRENT BLOCK IN FILE
62 000076	000000	ORPTR:	.BLKW	3		
63 000120	000000	READY1:	.WORD	0	;	OUTBUF POINTER
64 000122	000000	READY2:	.BLKW	3.		
65 000134	002166	BH11:	.WORD	0		;
66 000126	004166	BH12:	.WORD	0		OUTBUF+1024.
67 000130	000166	BLOW1:	.WORD	0		OUTBUF+2040.
68 000132	002166	BLOW2:	.WORD	0		OUTBUF
69 000134	000000	BPTR:	.WORD	0		OUTBUF+1024.
70 000136	002166	BUFEND:	.WORD	0		OUTBUF+1024.
71 000140	000202	CRPTR:	.WORD	WCRI		;
72 000166	000001	OUTBUF:	.BLKW	10.		;
73 000166			.BLKW	2043.		DISK BUFFER
74 000166			.END			

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

BH11	000124R	003	BH12	000126R	003	BLK1R	000002R	002	BLK1R	000006R	003	BLW1	000130R	003
BLW2	000132R	003	BP1R	000134R	003	BUFE1R	000136R	003	CHOUT	000000R	003	CRP1R	000140R	003
ENSC	000254R		ENSC1	000330R		ERR	000236R		FRP1R	000002R		NUM	000002	
NUM1	= 000035		GRP1R	000076R		OUTBUF	000166R		PC	-X000007		READY1	000120R	003
READY2	000122R	003	ROM	000000R	003	R0	-X000000	003	R1	-X000001		R2	-X000002	003
R3	-X000003		R4	-X000004		R5	-X000005		SP	-X000006		TPCNT	000000R	002
WCH1R	000000R	003	WCH1ST	000250R		WCH1	000202R		WCH2	000214R		WRTBUF	000000R	
WTR1K	000330R		...V2	= 000001										
.ABS.	000000	000												
DECCOM	000004	001												
RDCCOM	001166	003												

ENRORS DETECTED: 0

FREE CORE: 16368. WORDS

.DK1:WRTBUF/N:TTN/E:LC-WRTBUF



54	002066	000000	XLINI:	.WORD	0
55	002070	000000	YLINE:	.WORD	0
56	002072	000000	XLINF:	.WORD	0
57	002074	000000	YLINE:	.WORD	0
58				.BLKV	14.
59	002132	000000	DXMIN:	.WORD	50.
60				.BLKV	14.
61	002170	000001	OFSP:	.WORD	1
62		000000		.CSECT	IBUF
63	000000	000000	IUTS:	.WORD	0
64	000002	000000	IRUC:	.WORD	0
65		000000		.CSECT	ATPARA
66	000000		ATDLY1:	.BLKV	2
67	000004		ATDLY2:	.BLKV	2
68	000010		ATDLY3:	.BLKV	2
69		000000		.CSECT	NTRCOM
70				.BLKV	2065.
71	010042	000000	THRESH:	.WORD	0
72		000000		.CSECT	RCRCOM
73	000000	000000	ROM:	.WORD	0
74				.BLKV	30.
75	000076	000000	ORPWR:	.WORD	0
76	000100		XSCRID:	.BLKB	6
77	000106		SHEPLD:	.BLKB	6
78	000114	000001	CHETYP:	.WORD	1
79				.BLKV	8.
80	000136	000000	BUFEND:	.WORD	0
81				.BLKV	10.
82	000164	000001	OUTBUF:	.BLKB	2048.
83				.END	

: INDEX INTO OUTBUF

: H1 ADDRESS OF ACTIVE BUFFER

SYMBOL TABLE

ATM.Y1	000000R	004	ATDLY2	000004R	004	ATDLY3	000010R	004	BUFEED	000136R	006	CHTTP	000114R	006
DEJAY	000204R		DZMIN	002132R	002	FIL	000142R		FROMI	000210R		IRNG	000022R	003
INT3	000000R	003	NINI	000206R		ORPFR	000076R	006	OFSP	002170R	002	OUT	000174R	003
OUTBUF	000164R	006	PC	=X000007		RON	000000R	006	RO	=X000000		RI	=X000001	
K2	=X000002		R3	=X000003		R4	=X000004		R5	=X000005		SHFLID	000106R	006
SP	=X000006		STATUS	002034R	002	THRESH	010042R	006	TZ1	000010R	002	WTRUP	000000R	002
VEN	000000R		XBCRID	000100R	006	XLINI	002066R	002	XLIN2	002072R	002	YLINI	002070R	002
YLINE3	002074R	002												
.ABS.	000000	000												
	000232	001												
SEWTON	002172	002												
IBD.	000004	003												
ALPANA	000014	004												
RETCOH	010014	073												
RETCOH	004164	006												
ERRORS DETECTED:	0													
PARS COME:	16075. WORDS													

.DATA NSH/HTTH/E:LC=NSH

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

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[illegible]

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

CFS	000210R	003	CROUT = ***** C	000632R	000400R	000
FSTOP	010020R		GCALL	000634R		
IK	000646R		IY	000650R		
NUM1	= 000634		PC	=X000007		
R2	=X000002		R3	=X000003		
XACT	010030R	003	XAHIN	000000R0		
XMSG	000416R		XOUT	000162R		
. AL3.	000000	000				
DEPCOH	000022	001				
NTRCOH	010032	002				
NUM2	000000	003				

END	000632R	003	CRIN = ***** C	000632R	000400R	003
MAXK	000004R					
REWTR	010010R					
R4	=X000004					
XHI	000020R	002				
X0	000012R	002				

FIN	000400R	003	HOME	000000R	000400R	003
HINX			HINX			
R0			R0			
R5			R5			
XIN			XIN			

FSTART	010016R	003	START	010016R	003
IALPHA	000044R		IALPHA	000044R	
NUM	= 000001		NUM	= 000001	
R1	=X000001		R1	=X000001	
SP	=X000005		SP	=X000005	
XLO	000000R	003	XLO	000000R	003

ERRORS DETECTED: 0

FREE CORE: 16762. WORDS

.DK1:XAHIN/N:TTM/E:LC=XAHIN

1	.TITLE	ZOOM	.GLOBL	ZOOM,GRIN,HOME,CHOUT
2	.MCALL	SAVE,UNSAVE,CHTXT,CHSTUP,SUPTXT,.RECEP		
3	.RECDEV			
4	SAVE	012345		
5	JSR	PC,HOME		
6	MOV	#ZNSG,R5		:PRINT INPUT REQUEST
7	JSR	PC,CHOUT		
8	MOV	#CCALL,R5		
9	JSR	PC,GRIN		:DECODE DELAY
10	MOV	TDL,Y1,R1		
11	HUL	#10,,R1		
12	ADD	TDL,Y2,R1		
13	HUL	#10,,R1		
14	ADD	TDL,Y3,R1		
15	HUL	#10,,R1		
16	MOV	R1,DELY		
17	MOV	IX,R0		:CALCULATE X
18	MOV	#100,,R0		
19	SUB	X0,R0		
20	SUB	STOPX,R2		
21	MOV	STARTX,R2		
22	SUB	R2		
23	INC	R2,CLEN		
24	MOV	XH1,R2		
25	MOV	XLO,R2		
26	SUB	R2,R0		
27	NUL	#900,,R0		
28	DIV	MINX,R0		
29	SUB	CLEN,R0		
30	NUL	MAXX,R2		
31	MOV	MINX,R2		
32	SUB	R2,R0		
33	DIV	STARTX,R0		
34	ADD	DELY,R0		
35	ADD	R0,IX		:CHECK ZOOM IN OR OUT
36	MOV	IALPHA,#111		
37	CNP	ZIN		
38	BEQ	IALPHA,#117		
39	CNP	IALPHA,#117		
40	BEQ	ZOUT		
41	CLR	RENTR		
42	JMP	FIN		:ZOOM OUT
43	CNP	CLEN,#2048		
44	ECE	DRAT		:DOUBLE #POINTS
45	CLR	STARTX		
46	DEC	IACT		
47	MOV	CLEN,R2		
48	ASL	R2		
49	MOV	R2,STOPX		
50	MOV	IX,DELY		
51	SUB	CLEN,DELY		
52	CNP	DELY,#9990		:CHECK MAX DELAY
53	BCT	IS		
54	TST	DELY		
55	BCT	28		
56	CLR	DELY		
57	BR	25		

```

58 000324 016767 001000 010012' 18: MOV DELY, STARTX
59 000332 012767 003406 000770 MOV #9999., DELY
60 000340 166767 000764 010012' SUB DELY, STARTX
61 000346 066767 010012' 010014' ADD STARTX, STOPX
62 000354 026727 010014' 004000 CNP STOPX, #2048.
63 000362 003411 BLE 28
64 000364 162767 004000 010014' #2048., STOPX
65 000372 166767 010014' 010012' SUB STOPX, STARTX
66 000400 012767 004000 010014' #2048., STOPX
67 000406 000167 000360 ENCD
68 000412 016704 IRNG, R4
69 000416 006304 R4
70 000420 016424 NSR+2(R4), R4
71 000424 026727 IRNG, #9.
72 000432 002420 RRGUP
73 000434 005067 IRNG
74 000440 005267 IUTS
75 000444 026727 CNP IUTS, #2
76 000452 003410 BLE RRGUP
77 000454 012704 #1, R4
78 000460 012767 MOV #8., IRNG
79 000466 012767 #2, IUTS
80 000474 005267 IRNG
81 000500 016701 IX, R1
82 000504 005000 R0
83 000506 071004 R4, R0
84 000510 020427 CNP R4, #5
85 000514 001001 BNE 18
86 000516 006300 ASL R0
87 000520 162700 #1024., R0
88 000524 010067 R0, DELY
89 000530 005067 STARTX
90 000534 012767 #2048., STOPX
91 000542 000656 BCHK
92 000544 016704 IRNG, R4
93 000550 006304 R4
94 000552 016404 NSR(R4), R4
95 000556 005767 IRNG
96 000562 003004 BGT 18
97 000564 005767 IUTS
98 000570 003001 BGT 18
99 000572 000420 BR 38
100 000574 016700 IX, R0
101 000600 070004 R4, R0
102 000602 020427 CNP R4, #5
103 000606 001003 BNE 28
104 000610 071027 DIV #2, R0
105 000614 010001 R0, R1
106 000616 010167 R1, NSRX
107 000622 032701 #1024., R1
108 000626 020127 CNP R1, #12000.
109 000632 003430 IRATE.
110 000634 005067 STARTX
111 000640 005267 IACT
112 000644 016702 CLEN, R2
113 000650 006202 R2
114 000652 020227 R2, #16.

; DECREASE SAMPLE RATE
; CHECK MAX RANGE
; INCREASE SAMPLE INTERVAL
; CALCULATE DELAY
; SET START AND STOP
; ZOOM IN
; CHECK SAMPLE RATE
; HALF #POINTS
; CHECK LOWER BOUND

```



168 000016 000000	WORD	0
169 000020 000000	WORD	0
170 000000 000000	CSECT	ATPARA
171 000000 000000	WORD	0
172 003002 000000	WORD	0
173 003004 000000	WORD	0
174 000006 000000	WORD	0
175 000010 000000	WORD	0
176 000012 000000	CSECT	RTRCOM
177 000000 000000	BLKW	2052
178 000000 000000	WORD	0
179 010010 000000	WORD	0
180 010012 000000	WORD	0
181 010014 000000	BLKW	4
182 000000 000000	WORD	0
183 010026 000000	CSECT	IBUF
184 000000 000000	WORD	0
185 000000 000000	WORD	0
186 000002 000000	WORD	0
187 000001 000000	END	

XLO:  
XHI:

TDLY1:

TDLY2:

TDLY3:

RENTX:  
STARTX:  
STOPX:

IACT:

IUTS:  
IRNG:



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Appendix D

XC Module Descriptions

The transducer characterization task (XC) consists of 46 program modules. Of these, 23 are described in this appendix. The modules appear in alphabetical order as they are listed below.

BALL	Inputs ball and transducer identifications
BEGXC	XC initialization routine
CNDSPX	Console display routine (front panel)
CNTRXC	Accepts operator input to control system
CPL0T	Contour plot routine
D1	Display type 1 suboption input routine
DISPXC	Display routine
DUMPXC	Provides core dumps for debugging purposes
IRXC	Input range control routines
LSINTX	Interrupt service routine for LSI-11
ORDER	Puts points in order for plotting
PLTCL	Plots contour lines
PNE	Pulse and encode
RECXC	Records peak values from each pulse
RTL	Real time loop driver
SIXC	Source one input routine
SDTWP	Scans between points for CPL0T
SCANXC	Scanner control routine
SEARXC	Processes the R window
SPD	Scans peak data
STUBXC	Program stubs for future expansion
XC	Main transducer characterization driver
XCAXIS	Puts up axes and messages for contour plots

Module: BALL - ball and transducer ID input module

Language: Macro-11

Entry Point: BALL - ball ID input routine

Called By: CNTRXC

Calling Sequence: CALL BALL

External References: Commons

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

RCDCOM - recording common

Item	access	description
SNPLID	wo	Sample (ball) identification

External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal

Functional Description:

BALL prompts the operator and accepts input of a six character string identifying the ball.

Entry Point: XDUCER - transducer ID input routine

Called By: CNTRXC

Calling Sequence: CALL XDUCER

External References: Commons

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

XCCOM - Transducer characterization common

Item	access	description
XDUCID	wo	transducer identification

External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal

Functional Description:

XDUCER prompts the operator and accepts input of a six character string identifying the transducer.

Module: DEBXC - XC initialization routine

Language: Macro-11

Called By: CNTRXC, XC

Calling Sequence: CALL DEBXC

External References: Commons

ATPARA - Bionation common

Item	access	description
TDLY1	wo	MSD of trigger delay magnitude
TDLY2	wo	Second digit of trigger delay magnitude
TDLY3	wo	LSD of trigger delay magnitude
TLEV8	wo	Trigger level polarity
TLEV1	wo	MSD of trigger level magnitude
TSRC	wo	Trigger source
TSLOP	wo	Trigger slope
TCOUP	wo	Trigger coupling
TCNT	wo	Trigger control
ASEL	wo	Channel A selected flag
AAPC	wo	Channel A positive coupling
ABPC	wo	Channel B positive coupling
AAMC	wo	Channel A negative coupling
ABNC	wo	Channel B negative coupling
ARNG	wo	Channel A input range
ACNH	wo	Channel A mode
APOL	wo	Channel A polarity

IBUF - incoming data buffer common

Item	access	description
IUTS	wo	Sample rate units
IRNG	wo	Sample rate range
ITYP	wo	Interrupt mode
IDTH	wo	Data transfer mode
MODE	wo	Output Mode
IWDSTR	wo	Word start value
ISTREC	wo	End recording value

DSPCOM - display common

Item	access	description
DTYPE	wo	Display type
MINX	wo	Minimum of data range
MAXX	wo	Maximum of data range
TWNDT	wo	Time window types
WTP	wo	Window type

NTRCOM - inter routine common

Item	access	description
STARTX	wo	Low raw data point for display
STOPX	wo	High raw data point for display
RENTX2	wo	First option after RENTER

SCNCOM - scan common

Item	access	description
SOURCE	wo	Data source
SRCHTP	wo	Search type
TX1	wo	Total Scan X low
TY1	wo	Total scan Y low

STATUS	wo	Status of scan
DXIN	wo	Scan increment

RCDCOM - recording common

Icon	access	description
RDW	wo	Recording on flag
FDPNTR	wo	File block pointer
FBUF	wo	ASCII File description
FSTAT	wo	File status
CHNUM	wo	Active channel number
BLKNUM	wo	Block number in file
BLKCNT	wo	Total number of blocks in file
THXCD	wo	Threshold exceeded flag
XDCRID	wo	Transducer Identification

External References: I/O Registers

address	access	description
344	wo	Interrupt vector address for LSI-11
346	wo	Interrupt vector PS for LSI-11
167740	wo	Control Status register for LSI-11

External References: Files/LUNS

LUN	actions	description
All	r	All channels are purged by a .SRESET

External References: Subroutines

name	description
TEKIN	Sets up the interrupt vector for the Tektronix

Functional Description:

BEGXC sets all common areas to their initial state. All channels are purged and all interrupts enabled.

Module: CNDSPX - console display routine

Language: Macro-11

Entry Point: CONDSP

Called By: any or all modules

Calling Sequence: CALL CONDSP

External References: Commons

CONDSP may access any word of any common in the system. Any address in memory may also be accessed.

#### Functional Description:

CNDSPX is a routine to display any desired data on the console while MNS is running. The condition of the switch register determines what is to be displayed. There are two modes of operation:

#### I. Common Mode

Bits 13-15 determine which common is to be displayed. These are listed below:

- 0) DBGCOM - Debug common
- 1) SCNCOM - Scan common
- 2) XCCOM - Transducer common
- 3) NTRCOM - Intre routine common
- 4) IBUF - Data buffer common
- 5) DSPCOM - Display common
- 6) ATPARA - Biomation common
- 7) RCDCOM - Record common

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Bits 0-12 determine the offset in the selected common. This is always a word offset (even numbers only).

#### II. Absolute Mode

If bit 0 is set (number is odd), the word displayed is at the absolute address indicated by the switches minus one.

Module: CNTRXC - XC control and setup routine

Language: Macro-11

Called By: XC

Calling Sequence: CALL CNTRXC

External References: Commons

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer
LBLUP	ro	Label up flag

NTRCOM - inter routine common

Item	access	description
RENTX	r/w	Option to be selected on reentry to CNTRXC
STARTX	r/w	Start of displayed data in IBUF
STOPX	r/w	End of displayed data in IBUF
RENT2	r/w	Suboption selected on reentry
SSACT	r/w	Same scan active flag

SCNCOM - scan common

Item	access	description
SOURCE	wo	Source of data
SRCHTP	wo	Search type
STATUS	wo	Status of scan

RCHDOM - recording common

Item	access	description
WCHNUM	ro	Write channel number
RCHNUM	ro	Read channel number

DSPCOM - display common

Item	access	description
DTYPE	r/w	Display type
MINX	wo	Minimum of data domain
MAXX	wo	Maximum of data domain
XLO	wo	X axis minimum in data units
XHI	wo	X axis maximum in data units
YLO	wo	Y axis minimum in data units
YHI	wo	Y axis maximum in data units

External References: Subroutines

name	description
IRXCO	Sets initial input range
BEGIN	Initializes commons
FCLOSE	Closes files
S1	Source 1 setup routine
S2	Source 2 setup routine
ZOOM	Adjusts trigger delay, sample rate and display limits
TWINDO	Time window input routine
BALL	Inputs ball ID
D1	Inputs display parameters for contour plot
CHOUT	Outputs characters to terminal
ERASE	Erases Tektronix screen
HOME	Homes cursor on Tektronix
TC	Input trigger control parameters
DUMP	Provides core dumps

XDUCER    Inputs transducer ID  
DSETUP    Sets up for recording

External References: Files/LUNS

LUN	actions	description
RCHNUM	c	Recorded data file
WCHNUM		Write data file

Functional Description:

CNTRXC solicits keyboard entries for program option selection. All other operator interface routines are called by CNTRXC.

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Module: CPLLOT - contour plot generation routine

Language: Macro-11

Called By: DISPXC

Calling Sequence: CALL CPLLOT

External References: Commons

XCCOM - transducer characterization common

Item	access	description
PSI	r/w	Current point status
FBY	w/w	Current Y value
FP	r/w	Current 'front' point
BP	r/w	Current 'back' point
ASTAT	r/w	Array status
POPNT	r/w	Pointer to PD and POS
SBFLB	r/w	Flag to/from SBTWP
SFBP(100)	r/w	Status of F/B points (byte)
FPOINT(100)	ro	Front points array (byte)
BPOINT(100)	ro	Back points array (byte)
PD(1536)	wo	Points out of F/B processing
POS(1536)	wo	Status of PD points (byte)

External References: Subroutines

name	description
SBTWP	Searches between points in Y direction
SPD	Scans peak data (PD) for front/back points
ORDER	Puts points from PD in order for plotting

Functional Description:

CPLLOT is the primary routine driving the contour plot generation system. It is not a true subroutine, making a direct jump to ORDER.

Module: D1 - display type 1 parameter input routine

Language: Macro-11

Called By: CNTRXC

Calling Sequence: CALL D1

External References: Commons

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

XCCOM - transducer characterization common

Item	access	description
LBMIN	wo	Minimum length of line to be labeled

External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal

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Functional Description:

D1 prompts the user to select one of three contour plot labeling options. These options are: label all lines, omit labels on isolated points, and omit all labels.

Module: DISPXC - display control routine

Language: Macro-11

Called By: XC

Calling Sequence: CALL DISPXC

External References: Commons

IBUF - data buffer common

Item	access	description
IUTS	ro	Sample rate units
IRNG	ro	Sample rate range

ATPARA - Bionation common

Item	access	description
TDLY1	ro	MSD of trigger delay (BCD)
TDLY2	ro	2nd digit of trigger delay
TDLY3	ro	LSD of trigger delay

DSPCOM - display common

Item	access	description
DTYPE	ro	Display type
MINX	wo	Minimum of data domain
MAXX	wo	Maximum of data domain
NDBX	wo	Number of digits behind decimal point on X tic labels.
NDBY	wo	Number of digits behind decimal point on Y tic labels.

NTRCOM - inter routine common

Item	access	description
STARTX	ro	Start of displayed data in IBUF
STOPX	ro	End of displayed data in IBUF
SSACT	ro	Same scan flag

XCCOM - transducer characterization common

Item	access	description
SPEAK	ro	Scan peak
CTHRES	wo	Contour plot threshold
PCNT	wo	Percent message
PNUM	wo	Plot number

TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

External References: Subroutines

name	description
XCAXIS	Plots axis and displays messages for contour plot
CPLLOT	Produces contour plots
HOME	Homes cursor on Tektronix terminal
FPLLOT	Plots raw data
IPLOT	Point plot routine
PRTH	Prints horizontally on Tektronix
PRTV	Prints vertically on Tektronix
ALPHA	Puts the terminal in alpha mode
ERASE	Erases screen on Tektronix
CHOUT	Outputs messages to terminal

**Functional Description:**

DISPXC displays the selected data on the Tektronix graphics terminal. FPLOT and CPLOT are called to do the actual plotting.

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Module: DUMPXC - provides core dumps

Language: Macro-11

Entry Point: DUMP

Called By: CNTRXC

Calling Sequence: CALL DUMP

External References: Commons

DUMPXC may access any word of any common in the system. Any address in memory may also be accessed.

External References: Subroutines

name	description
B2AO	Binary to ASCII octal conversion
ERASE	Erases Tektronix screen
HOME	Homes cursor on Tektronix
CHOUT	Outputs messages to Tektronix
CRLF	Sends carriage return/line feed to terminal

Functional Description:

DUMPXC prompts the user and waits for a particular common area or memory region to be selected. The specified region is dumped on the system console in octal words.

Module: IRXC - input range control routines

Language: Macro-11

Entry Point: IRXC0 - input range input and setup routine

Called By: CNTRXC

Calling Sequence: CALL IRXC0

External References: Commons

ATPARA - Biomation common

Item	access	description
ACCNT	wo	Channel A control
APC	r/w	Channel A positive coupling
ACRNB	wo	Channel A input range

XCCOM - transducer characterization common

Item	access	description
IRCND	wo	Input range command
ARACT	wo	Auto ranging active flag

TEKCOM - tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal
ERASE	Erases Tektronix screen
HOME	Homes cursor on Tektronix

Functional Description:

IRXC0 prompts the operator and solicits inputs for the selection of control parameters. ATPARA is set up so that BSETUP will put the Biomation in the desired mode. A basic input range command is formed for use by IRXC1.

Entry Point: IRXC1 - input range change routine

Called By: RTL

Calling Sequence: CALL IRXC1

External References: Commons

XCCOM - transducer characterization common

Item	access	description
IRRD	r/w	Input range change request flag
IRCND	ro	Input range command for Biomation
ARACT	ro	Auto ranging active flag

External References: I/O Registers

address	access	description
164042	wo	Biomation interface control register

External References: Subroutines

name	description
FLBT	Tests flag from Biomation for command acceptance

Functional Description:

IRXC1 sends the input range command produced by IRXC2 to the Biomation when an input range change has been requested.

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Entry Point: IRXC2 - requests range change if needed

Called By: RTL

Calling Sequence: CALL IRXC2

External References: Commons

ATPARA - Biocation common

Item	access	description
ACRNG	r/w	Channel A input range

XCCOM - transducer characterization common

Item	access	description
PEAK	ro	Peak of current point in scan
IRRG	r/w	Input range change request flag
IRCHD	r/w	Input range command to Biocation
ARACT	ro	Auto ranging active flag

Functional Description:

If auto-ranging is active, IRXC2 checks to see if the peak of the current point falls outside of the desired range. If so, a range change is requested and a new input range command is formatted.

Module: LSINTX - interrupt service routine for LSI-11

Language: Macro-11

Vector Set By: DEBXC

Vector Address: 344/345

CSR Address: 167740

Interrupt occurs when bit 5 of CSR is set (interrupt enable) and bit 15 is set externally. Bit 15 is set as a result of setting bit 1 of the CSR of the corresponding interface on the LSI-11.

External References: Commons

SCNCOM - scan common

Item	access	description
NCDR	wo	Encoder readings
NCDRCV	r/w	Encoder readings recieved flag
SCNFIN	r/w	Scan finished flag
LSIDAT	r/w	Data from LSI-11
ERROR	r/w	Error count
ARIVED	r/w	Completion flag for move command
COMIP	r/w	Communications in progress flag
SPCNT	r/w	Scan pass count

DBGCOM - debug common

Item	access	description
TFCNT	r/w	Missed point count

XCCOM - transducer characterization common

Item	access	description
CCNTR	wo	Column counter

External References: I/O Registers

address	access	description
167740	r/w	Command Status Register for LSI-11
167744	ro	Read data register for LSI-11

External References: Subroutines

name	description
RECXC	Records peaks in PD array

Functional Description:

LSINTX services the interrupts generated by the LSI-11 and processes the returned command and status to increment various counters and flags. Encoder readings sent by the LSI-11 are placed in common. If a 'missed point' message is recieved during a scan, RECXC is called to duplicate the peak from the previous point in the scan.

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Module: ORDER - puts points in order for plotting

Language: Macro-11

Called By: CPLLOT

Calling Sequence: JNP ORDER

It is assumed that all 6 registers have been saved on the stack.  
They will be restored.

External References: Commons

XCCOM - transducer characterization common

Item	access	description
POPNT	ro	Pointer to PO and POS
LPADR	r/w	Address of most recent point processed by ORDER.
OPCNT	r/w	Ordered point count
POSEND	r/w	End of POS array
PSCNT	r/w	Pass count
PO(1536)	ro	Points out of CPLLOT
POS(1536)	rw	Status of PO points (byte)

External References: Subroutines

name	description
PLTCL	Plot lines and points for contour lines
CCPNT	Completes contour line and labels it

Functional Description:

ORDER puts the points derived by CPLLOT in order and plots the contour lines connecting them. When finished, control is returned to the module which called the calling program(DISPXC).

Module: PLTCL - plot contour lines

Language: Macro -11

Entry Point: PLTCL - plots points on contour line

Called By: ORDER

Calling Sequence: CALL PLTCL

External References: Commons

XCCOM - transducer characterization common

Item	access	description
XFACT	ro	Scale factor for X axis of display
YFACT	wo	Scale factor for Y axis
XOFF	ro	X axis offset for display
YOFF	ro	Y axis offset
OPCNT	ro	Ordered point count

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External References: Subroutines

name	description
IPLOT	Plots points and lines on Tektronix
ALPHA	Puts terminal in alpha mode
CHOUT	Outputs messages to the terminal

Functional Description:

PLTCL plots points on the graphics terminal to give contour lines. Upon entry, OPCNT should have the count of points plotted on this line so far. OPCNT = 0 results in the beginning of a new line.

Entry Point: CCPLT - terminates and labels contour lines

Called By: ORDER

Calling Sequence: CALL CCPLT

External References: same as PLTCL above

Functional Description:

CCPLT plots the final point in the contour line and labels the line with a percentage if OPCNT > LBMIN. No new point is passed to CCPLT as the point plotted by it is the last one passed to this module by a call to PLTCL.

Module: PNE - sends 'Pulse when ready' to LSI-11

Language: Macro-11

Called By: RTL

Calling Sequence: CALL PNE

External References: Commons

SCNCON - scan common

Item	access	description
SRCHTP	ro	Search type
CONAND	wo	Command to LSI-11
NCRCV	wo	Encoder readings recieved flag
SCNFIN	ro	Scan finished flag

External References: Subroutines

name description

ARM Sends 'arm' command to Bionation 8100

WRTLSI Sends command packet to LSI-11

CONDSP Console display routine

Functional Description:

If SRCHTP = 0, PNE returns to the calling routine without taking any action. Otherwise, PNE arms the Bionation 8100 and, if SCNFIN = 0, sends a 'pulse when ready' command to the LSI-11.

Module: RECXC - records peak values in PD array

Language: Macro-11

Called By: RTL, LSINTX

Calling Sequence: CALL RECXC

External References: Commons

ATPARA - Bioaction common

Item	access	description
ACRNG	ro	Channel A input range

XCCOM - transducer characterization common

Item	access	description
PEAK	ro	Peak of current point in scan
SPEAK	r/w	Peak of scan
CCNTR	r/w	Column counter
PDPNTR	wo	Pointer to PD array
PD	ro	Peak data array

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SCNCOM - scan common

Item	access	description
SRCHTP	wo	Search type
STATUS	r/w	Status of scan
SCNFIN	r/w	Scan finished flag
SPCNT	r/w	Scan pass count

Functional Description:

RECXC records the PEAK in PD at the position given by CCNTR and SPCNT. The scan peak is updated if necessary. SCNFIN is set if PD becomes full.

Module: RTL - real time loop

Language: Macro-11

Called By: XC

Calling Sequence: CALL RTL

External References: Commons

XCCOM - transducer characterization common

Item	access	description
------	--------	-------------

IRRQ	wo	Input range change request flag
------	----	---------------------------------

SCNCOM - scan common

Item	access	description
------	--------	-------------

SRCHTP	r/w	Search type
--------	-----	-------------

STATUS	wo	Status of scan
--------	----	----------------

NCDRCV	ro	Encoder readings recieved flag
--------	----	--------------------------------

SCNFIN	ro	Scan finished flag
--------	----	--------------------

External References: Subroutines

name	description
------	-------------

PNE	Pulse and encode
-----	------------------

CONDSP	Console display
--------	-----------------

BB100	Gets data from Biomation
-------	--------------------------

IRXC1	Changes input range if requested
-------	----------------------------------

IRXC2	Requests input range change if needed
-------	---------------------------------------

SEARXC	Gets peak from signal data
--------	----------------------------

REXC	Records peak in PD array
------	--------------------------

Functional Description:

RTL cycles through all of the time critical operations during a scan.

Module: SIXC - Source 1 (real time data) setup routine  
Language: Macro-11  
Entry Point: S1  
Called By: CNTRXC  
Calling Sequence: CALL S1  
External References: Commons

SCNCOM - scan common

Item	access	description
SRCHTP	wo	Search type
TX1	r/w	Total scan low x
TY1	r/w	Total scan low Y
STATUS	wo	Status of scan
NCDR	ro	Encoder readings
XLIM1	wo	Low X limit of scan
YLIM1	wo	Low Y limit of scan
XLIM2	wo	High X limit of scan
YLIM2	wo	High Y limit of scan
COMAND	wo	Command to LSI-11
NCDRCV	r/w	Encoder readings recieved flas
SCNFIN	wo	Scan finished flas
DXMIN	ro	Scan increment

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TEKCOM - Tektronix common

Item	access	description
ICHBUF	r/w	Input character buffer

External References: Subroutines

name	description
ERASE	Erases Tektronix screen
HONE	Homes cursor on Tektronix terminal
CHOUT	Outputs characters to Tektronix
BELL	Rings bell on Tektronix
WRTLSI	Sends command packets to LSI-11

Functional Description:

SIXC prompts the user to select either the 'scan' or 'no scan' option. If 'no scan' is selected, parameters in commons are set up to allow multiple pulses at the current scanner position. If 'scan' is selected, SIXC sends an 'encode on reset' command to the LSI-11. When the reset button on the remote control is pressed and released, the encoder readings are sent to the 11/45 and become the center of the scan. Common variables are set up to cause the selected scan to be executed when 0 (so) is entered.

Module: SBTWP - search between points

Language: Macro-11

Called BY: CPLLOT

Calling Sequence:

JSR PC,SBTWP

Where:

R0 - points into the SFBP array

R1 - indexes the FPOINT and BPOINT arrays

R4 - indicates number of row to be searched

These registers represent return arguments and may be modified. Other registers are disturbed.

External References: Commons

XCCOM - transducer characterization common

Item	access	description
CTHRES	ro	Current contour line threshold
PS1	r/w	Current point status
FBY	r/w	Current Y value (row number)
BP	r/w	'Back' point
POPNT	r/w	Pointer to PO and POS
SDFLG	ro	Flag to SBTWP
SFBP	ro	Status array for front/back points
FPOINT	ro	'Front' points array
BPOINT	ro	'Back' points array
PO	wo	Points out of CPLLOT processing
POS	wo	Status array for elements of PO
PD	ro	Peak data array

External References: Subroutines

name	description
INSP	Inserts points into PO/POS

Functional Description:

SBTWP searches a row in the PD array between two front or back points which are discontinuous. Points which are found to be on the contour line at the given threshold are added to the PO array and marked as either 'front fill' or 'back fill' points in the corresponding POS array element.

Module: SCANXC - initiates scans and communicates with LSI-11

Language: Macro-11

Entry Point: SCANXC - scan initiation routine

Called By: XC

Calling Sequence: CALL SCANXC

External References: Commons

XCCOM - transducer characterization common

Item	access	description
SPEAK	wo	Current scan peak
PDPNTR	wo	Pointer to peak data array (PD)

SCNCOM - scan common

Item	access	description
SOURCE	ro	Data source
SRCHTP	ro	Search type
STATUS	ro	Status of scan
XLIN1	ro	Low X limit of scan
YLIN1	ro	Low Y limit of scan
XLIN2	ro	High X limit of scan
YLIN2	ro	High Y limit of scan
COMMAND	wo	Command to LSI-11
CHDAT(9)	wo	Data for command to LSI-11
NCDRCV	wo	Encoder readings recieved flag
SCNFIN	wo	Scan finished flag
AXIS	ro	Scan axis 0/1 --> X/Y
DXMIN	ro	Scan increment
SPCNT	wo	Scan pass count

DBGCOM - debug common

Item	access	description
TFCNT	wo	Count of missed points

External References: Subroutines

name	description
ARM	Arms Biomation 8100
CONDSP	Console display routine
WRTLSI	Sends packets to LSI-11

Functional Description:

When SOURCE  $\neq$  1, control returns to calling routine without any action being taken. When SOURCE = 1, two possible actions exist. The action taken depends on the values of STATUS and SRCHTP. If STATUS  $\leq$  0 or SRCHTP = 0, a "pulse and encode" command (3) is sent to the LSI-11, and control returns to the calling routine. Otherwise, an X/Y scan is initiated by setting all common variables to their start of scan values and sending a "scan" command (4) to the LSI-11.

Entry Point: WRTLSI- sends command packets to LSI-11

Called By: SCANXC,PNE,TEKMOD

Calling Sequence:

```
MOV    $WDCNT,R0
JSR    PC,WRTLSI
```

where: WDCNT is length of command packet in words

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External References: Commons

SCNCOM - scan common

Item	access	description
COMAND	r/w	Command to LSI-11
CMDAT(9)	ro	Command data
COMIP	r/w	Communications in progress flag

External References: I/O Registers

address	access	description
167740	r/w	Command Status Register of DR11-C to LSI-11
167742	wo	Write data register of DR11-C to LSI-11

Functional Description:

WRTLSI passes variable length packets of data to the LSI-11 across an interface consisting of a pair of DR11s.

Module: SEARXC - search peak window

Language: Macro-11

Called BY: RTL

Calling Sequence: CALL SEARXC

External References: Commons

IBUF - data buffer common

Item	access	description
IBUF	ro	Raw data buffer

DSPCOM - display common

Item	access	description
TWND	ro	Time windows
TWNDT	ro	Time window types

XCCOM - transducer characterization common

Item	access	description
PEAK	wo	Point peak

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**Functional Description:**

SEARXC searches the R window in the raw data and finds the peak value. If no R window has been placed or the window has zero length, control is returned to calling routine without searching data and with PEAK unchanged.

Module: SPD - scan peak data

Language: Macro-11

Called By: CPLOT

Calling Sequence: CALL SPD

External References: Commons

XCCOM - transducer characterization common

Item	access	description
------	--------	-------------

CTHRES	wo	Current contour line threshold
--------	----	--------------------------------

ASTAT	r/w	Array status
-------	-----	--------------

SFBP(100)	r/w	Status of F/B points
-----------	-----	----------------------

FPOINT(100)	wo	'Front' points (byte)
-------------	----	-----------------------

BPOINT(100)	r/w	'Back' points (byte)
-------------	-----	----------------------

PD(10000)	ro	Peak data
-----------	----	-----------

#### Functional Description:

SPD scans across the rows of the PD array to find one 'front' point and one 'back' point on each of the rows selected for processing. Rows where no 'front' point is found are deselected for the next search pass. A row is selected for processing by setting the corresponding byte in the SFBP array to a non-zero value. If ASTAT=2, the search begins at the left end of the rows. If ASTAT = 1, the search begins after the last 'back' point for the row. If no 'front' point is found after search of all rows, ASTAT is cleared indicating that processing of the PD array is complete.

Module: STUBXC

Language: Macro-11

Entry Points: DSETUP, S2 ,FCLOSE, WZSCAN, ZMOVE

Called By: CNTRXC, XC

Functional Description:

Control is returned to calling module with no action taken. STUBXC provides recovery from attempts to call upon features not yet included in the XC task.

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Module: XC - transducer characterization driver

Language: Macro-11

Called BY: Console control

Run Procedure: .RU XC

External References: Commons

NTRCOM - inter module common

line	access	description
------	--------	-------------

RENTX	ro	Option to be selected on reentry to CNTRXC
-------	----	--

TEKHOD - Tektronix common

line	access	description
------	--------	-------------

ICHBUF	r/w	Input character buffer
--------	-----	------------------------

External References: Subroutines

name	description
------	-------------

BEGXC	XC initialization routine
-------	---------------------------

CNTRXC	Control and operator interface routine
--------	--

BSETUP	Biomotion setup routine
--------	-------------------------

ZMOVE	Z axis move routine
-------	---------------------

SCANXC	Scan initiation routine
--------	-------------------------

RTL	Real time loop
-----	----------------

WZSCAN	Writes complete scan to disk
--------	------------------------------

UNPACK	Unpacks raw data for display
--------	------------------------------

DISPXC	Displays data on graphics terminal
--------	------------------------------------

Functional Description:

The XC module drives the transducer characterization task and directs keyboard entries to the control module CNTRXC.

Module: XCAXIS - puts up axes and borders for contour plots

Language: Macro-11

Called By: DISPXC

Calling Sequence: CALL DISPXC

External References: Commons

SCNCOM - scan common

Item	access	description
TX1	ro	X coordinate of scan center
TY1	ro	Y coordinate of scan center
TZ1	ro	Z coordinate of scan center

DSPCOM - display common

Item	access	description
TWND	ro	Time windows
TWNT	ro	Time window types

XCCOM - transducer characterization common

Item	access	description
XDCRID	ro	Transducer ID
PNUM	ro	Plot number

RCDCOM - recording common

Item	access	description
SMPLID	ro	Sample ID (ball ID)

IBUF - data buffer common

Item	access	description
IUTS	ro	Sample rate units
IRNG	ro	Sample rate range

ATPARA - Biomation common

Item	access	description
TDLY1	ro	MSD of trigger delay (BCD)
TDLY2	ro	2nd digit of trigger delay
TDLY3	ro	LSD of trigger delay

External References: Subroutines

name	description
CHOUT	Outputs messages to the terminal
IPLOT	Plots points and lines on the Tektronix

Functional Description:

XCAXIS puts up axes and border messages for the contour plots. Windowed distance from ball is calculated internally. It is assumed that the R window has been placed centered on the ball's front surface signal and that the connective fluid is water.

In addition to the modules described on the previous pages there are two sets of other modules included in the transducer characterization task.

The first group is that set of modules which are identical in function to modules in the primary ultrasonics task but which differ in the common areas which they use. These are tabulated below.

XC module Corresponding module

PLTWXC	PLTW
WINTXC	WINT
TWINDX	TWINDO
ZOOMXC	ZOOM
TEKNDX	TEKMOD

The second set of modules are completely identical with the modules used in the primary ultrasonics task and bear the same name.

UNPACK	CHANN
DBI	TIMER
DBSETUP	OUTH
FPLOTT	RECON
TC	FLGT
B2A0	BRESET
PAXIS	READS
PSCALE	THBASE
IENCDE	BATDLY

Appendix E

Description of XC Common Areas

Nine named common areas are included in the transducer characterization task.

name	words	use
ATPARA	48	Biomation control parameters
IBUF	2042	Raw data buffer
TEKCON	2	Tektronix interface
DSPCON	136	Display parameters
DBGCON	2	Debug data
NTRCON	5	General task parameters
SCNCON	61	Scan parameters
RCDCON	59	Recording parameters
XCCON	12509	Transducer data

The first five of these are identical to commons of the same name used in the primary ultrasonics task. The remaining four are described on the following pages.

Common: NTRCON - inter-module common

Accessed by: CNDSPX, DISPXC, DEGXC, WINTXC, PLTXC, TWINDX, XC, ZOOMXC,  
DUMPXC, CNTRXC

offset	name	description
0	RENTX	First option to be selected on reentry to CNTRXC, single ASCII character. If zero, will wait for operator input.
2	STARTX	Start of displayed data in IBUF, offset in words. Before UNPACK, STARTX is offset in bytes.
4	RENTX2	Sub-option to be selected after RENTX is selected. -1 if unused.
8	SSACT	Scan scan active flag.

Common: RCDCOM - recordings common

Accessed By: CNDSPX,DUNPXC,BEGXC,TWINDX,PALL,CNTRXC,XCAXIS

offset	name	description
0	RON	Recording on files
2	FBPNTR	File block pointer, contains absolute address of RAD50 fileblock. If zero, no active file
4	RBUF(4)	RAD50 fileblock for optional file
12	FBL	File buffer length. Always = 10.
14	FBUF(10)	ASCII filename buffer (bytes)
24	DFLT(4)	RAD50 fileblock for default file
32	DBL	Default filename length. Always = 10.
34	FSTAT	File status, 1= existing file
46	FSTAT2	Device full files (no room for file)
48	WCHNUM	Write channel number for recording data
50	RCHNUM	Read channel number
52	CHNUM	Active channel number
54	BLKNUM	Number of current block in file
56	BLKCNT	Block count: total number of blocks in file
58		Unused
60	THXCD	Threshold exceeded flag(unused)
62	OBPNTR	Unused
64	XDCRID(6)	Transducer Identification, ASCII
70	SNPLID(6)	Sample Identification, ASCII

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Common: SCNCOM - scan common

Accessed By: CNDSPX, DUMPXC, BEBXC, SIXC, SCANXC, CNTRXC, LSINTX,  
TEKMDX, RECXC, PNE, RTL, XCAXIS

offset	name	description
0	SOURCE	Data source: 1=real time, 2=recorded data, 3=same scan
2	SRCHTP	Search type: 0=no search, 1= total scan
4	TX1	X coordinate of center of scan
6	TY1	Y coordinate of center of scan
8	TZ1	Z coordinate fo center of scan
10	Spares(9)	Unused
28	STATUS	Status of scan: -1=no scan, 0=scan complete, 1=scan in progress, 2=new scan
30	Spares(5)	Unused
40	NCDR(7)	Encoder readings from LSI-11. Only 1st 3 are used. They are X,Y,Z.
54	XLIM1	Low X limit of scan
56	YLIM1	Low Y limit of scan
58	XLIM2	High X limit of scan
60	YLIM2	High Y limit of scan
62	COMAND	Command to LSI-11 . The valid commands are listed in the section on SCAN.
64	CMDAT(9)	Command data for LSI-11. The command formats are listed in the section on SCAN
82	NCDRCV	Encoder readings recieved flas
84	SCNFIN	Scan finnished flas
86	AXIS	Scan axis 0/1 --> X/Y
88	NUMPNT	Number of points on scan axis
90	DXIN	Scan increment
92	LSIDAT(11)	Data from LSI-11. Only 4 words are used. Format listed in SCAN
114	ERROR	Scan error count or flas
116	ARIVED	Move command completion flas
118	COMIP	Communications in progress flas
120	SPCNT	Scan pass count

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Common: XCCOM - transducer characterization common

Accessed By: CNDSP, ORDER, PLTCL, SCANXC, IRXC, SBTWP, SPD,  
DUMPCX, CPLOT, LSINTX, DI, BALL, DISPCX, RECXC, RTL, SEARXC, XCAXIS

offset	name	description
0	PEAK	Peak of current pulse
2	IRRG	Input range change request flag
4	SPEAK	Scan peak.
6	XDCRID(6)	Transducer Identification
12	IRCHD	Input range command for Bionation
14	CTHRES	Current contour line threshold
16	PS1	Current point status (for ORDER)
18	FBY	Current Y value/row number (ORDER)
20	FP	Current 'front' point
22	BP	Current 'back' point
24	ASTAT	Array status: 0=all points found, 2 = beginning new array
26	POPNTN	Pointer into PO and POS arrays
28	LPADR	Address of last point processed by ORDER
30	PCNT(9)	Percentage message in CHOUT compatible form
48	XFACT	Scale factor for X axis of display = 7
50	YFACT	Scale factor for Y axis of display = 7
52	XOFF	X axis offset for display. Always = 162
54	YOFF	Y axis offset for display Always = 30
56	CCNTR	Column counter
58	Spares(18)	Unused
94	PNUM	Plot number, 0-3, for CPLOT
96	ARACT	Auto-ranging active flag
98	LBLMIN	Minimum point count for line to be labeled.
100	OPCNT	Ordered point count
102	PDPNTR	Pointer into PD array
104	SBFLG	Flag to SBTWP
106	POSIND	End of POS array
108	PSCNT	Pass count for scan
110	SFBP	Status array for front/back points
210	FPOINT	Front points array
310	BPOINT	Back points array
312	PO(1536)	Points out of CPLOT
3384	POS(1536)	Status of PO points
4920	PD(10000)	Peak data array (100.x100.)

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**Appendix F**

**XC Module Listings**

```

1
2
3
4
5
6
7 000000
8 000000
9 000010
10 000014 016502 000004
11 000020 017501 000002
12 000022 073027 000001
13 000026 062700 000000
14 000032 110022 000005
15 000034 012703 000003
16 000040 005000 000000
17 000042 073027 000003
18 000046 062700 000000
19 000052 110022
20 000054 077307
21 000056
22 000060 000207
23 000061

```

.TITLE B2A0  
 ;CONVERTS BINARY TO ASCII OCTAL  
 ;R5 IS LINK: 2(R5) IS VALUE  
 ; 4(R5) IS ADDRESS OF RESULT  
 .CLOBL B2A0  
 .MCALL SAVE, UNSAVE, .REGDEF  
 .REGDEF  
 SAVE 0123  
 MOV 4(R5), R2  
 MOV 02(R5), R1  
 CLR R0  
 ASHC #1, R0  
 ADD #60, R0  
 MOV R0, (R2)+  
 MOV #5, R3  
 CLR R0  
 ASHC #3, R0  
 ADD #60, R0  
 MOV R0, (R2)+  
 SOB R3, 15  
 UNSAVE 3210  
 RTS PC  
 .END

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B2A0 RT-11 MACRO VM02-12 21-NOV-79 PAGE 1+  
SYMBOL TABLE

B2A0	00000000RC	PC							
R3	=X0000003	R4							
.ANS.	0000000	000							
	GC:1370	001							
ENR0R3 DETECTED: 0									
FREE CORE: 17106. WORDS									
.DK1: B2A0/N: TTN/E: LC= B2A0									

R0 =X0000007  
R5 =X0000004

R1 =X0000000  
SP =X0000005

R2 =X0000001  
=X0000006

R3 =X0000002

**F-4**

DB1

;BIONATION 0100 P RT-11 MACRO VM02-12 21-NOV-79 PAGE 1+

50 000152	005767	000142	TSTF:	TST	INTFLC	
59 000152	001775			BEQ	TSTF	
60 000156	004767	000000		JSR	PC, FLCT	
61 000160	012737	161042		MOV	#OFF, 0-CTREG	
62 000164	004767	000000		JSR	PC, FLCT	
63 000172	012737	161042	RSTR:	MOV	#EDIT, 0-CTREG	
64 000176	004767	000000		JSR	PC, FLCT	
65 000204						
66						
67						
68						
69 000210	022767	000001	EXTSCN:	CHP	#1, IDTH	
70 000216	001007			BNE	OUT	
71						
72 000220	012700	001000				
73 000224	012701	000034	EXT:	MOV	#2043, R0	
74 000230	111102		EXLP:	MOV	#1BUF, R1	
75 000232	010221			MOVB	(R1), R2	
76 000234	077603			MOV	R2, (R1)+	
77 000236			OUT:	SUB	R0, EXLP	
78 000244	000207			UNSAVE	210	
79				RTS	PC	

;WAIT FOR INTERRUPT TO COMPLETE

EXTEND SIGN FOR BUFFER

SINGLE WORD TRANSFER EXTEND SIGN

;RETURN TO CALLING PROGRAM

```

1 000246 032737 000200 164040
2 000234 001007
3 000256 012757 000001 000012
4 000264 012757 177777 000026
5 000272 000002
6 000274 005267 000020
7 000300 042737 000376 164040
8 000306 000002
9
10
11
12

```

NPR INTERRUPT ROUTINE

```

;200,0,STREC      ;IS DONE FLAG ON
;NPRDN            ;YES
;1,1,ERR          ;SET ERROR CODE TO 1
;-1,INTFLG        ;INDICATE ERROR RETURN
;INTFLG           ;INC INTERRUPT FLAG
;376,0,STREC

```

```

BIT
BNE
NOV
NOV
RTI
INC
BIC
RTI

```

```

NPRINT:
NPRDN:

```

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1	164000	MANAL	=	164000	*** BIONATION 8100 FUNCTION CODES ***
2	164010	CONTRCP	=	164010	! COMPLETE MANUAL MODE
3					! TIME BASE C.C. BITS ON
4	164600	CUNSF	=	164600	! CLEAR & UPDATE STATUS WORD
5	164500	PLGTF	=	164500	! PLOT
6	164420	ARMF	=	164420	! ARM
7	164410	TRIGF	=	164410	! TRIGGER
8	164401	RESETF	=	164401	! RESET
9					! READ STATUS REGISTER
10	165000	RDST3	=	165000	! ENABLE OUTPUT DATA
11	165400	DOUTEN	=	165400	! OFF MODE
12					! AUTO MODE
13	167000	OFF	=	167000	! EDIT MODE
14	167001	AUTO	=	167001	
15	167002	EDIT	=	167002	
16					
17					
18					
19					

1	000310	114	104	STS:	.BYTE	114.104
2				;		
3				;	VARIABLES	
4	000312	000000		MDT2:	.WORD	0
5	000314	000000		MDT4:	.WORD	0
6	000316	000000		MDCT1:	.WORD	0
7	000320	000000		INTFLG:	.WORD	0
8	000322	000000		STWD:	.WORD	0
9	000324	000000		MCWD:	.WORD	0
10	000326	000000		MSWD:	.WORD	0
11	000330	000000		TVAL:	.WORD	0
12				;		
13				;		
14	000000	000000			.CSECT	IBUF
15	000000	000000		IUTS:	0	
16	000002	000000		IRNG:	0	
17	000004	000000		ITYP:	0	
18	000006	000000		IBTH:	0	
19	000010	000000		MODE:	0	
20	000012	000000		IEER:	0	
21	000014	000000		IOPTSC:	0	
22	000016	000000		IMSTR:	0	
23	000020	000000		ISTRDC:	0	
24	000022	000000		IEDRDC:	0	
25	000024	000000	000000	CMPS:	0.0	
26	000030	000000	000000	CRNG:	0.0	
27	000034	000000	000000	IBUF:	.BLKW	2048.
28		000001			.END	

;SAMPLE INTERVAL UNITS(0-2) REF: B8100 MANUAL P36  
 ;SAMPLE INTERVAL RANGE(0-9) REF: B8100 MANUAL P37  
 ;INTERRUPT TYPE PRI OR XPR.  
 ;DATA TRANSFER MODE, SINGLE OR DOUBLE  
 ;OUTPUT MODE, AUTO OR EDIT  
 ;RETURN ERROR CODE -1 -> NO ERROR  
 ;OPT SCALE VALUE ERROR  
 ;WORD START VALUE  
 ;START RECORD  
 ;END RECORD

DO NOT WRITE IN THESE SPACES

[illegible]

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```

1 2 3 4 000324 005067 000000'
5 000330 005067 000002'
6 000334 005067 000016'
7 000340 005067 000054'
8 000344 005067 000056'
9 000350 005067 000054'
10 000354 005067 000056'
11 000360 012767 001111 000070'
12 000366 005067 000074'
13 000372 012700 000014'
14 000376 112700 000010'
15 000404 077004
16 000406 012737
17 000414 005037 000036'
18 000420 012737 000030'
19 000426
20 000430 005067 000362'
21 000434 005067 000364'
22 000440 005067 000366'
23 000444 005067 000370'
24 000450 005067 000412'
25 000454 000207
26 000458 000000'
27 000500 000000
28 000502 000000
29 000504 000012
30 000506 000012
31 000508 000000
32 000510 000000
33 000512 000000
34 000514 000000
35 000516 000000
36 000518 000000
37 000520 000000
38 000522 000000
39 000524 000000
40 000526 000000
41 000528 000000
42 000530 000000
43 000532 000000
44 000534 000000
45 000536 000000
46 000538 000000
47 000540 000000
48 000542 000000
49 000544 000000
50 000546 000000
51 000548 000000
52 000550 000000
53 000552 000000
54 000554 000000
55 000556 000000
56 000558 000000
57 000560 000000

; BEGIN:
; GLOBL LSIINT,BEGINI
; MCALL .SRESET,.RECDEF
INITIALIZE RCDCOM
; TURN RECORDING OFF
; SET NO ACTIVE FILE
RON:
RBPNT:
RBUF:
FBL:
DFLT:
DUF:
FSTAT:
FSTAT1:
CHNUM:
BLKCD:
THXCD:
QBPTR:
XBLID:
SBLID:
DTYPE:
MINX:
MAXX:
MAXY:
YO:
XLO:
XHI:
YLO:
YHI:
; CLEAR TIME WINDOW TYPES
; CLEAR WINDOW TYPE
; RECORDING ON FLAG
; FILE BLOCK POINTER
; RAD50 FILE BLOCK
; FILE STATUS NO ROOM ON DK1
; FILE STATUS 1=OLD
; THRESHOLD EXCEEDED FLAG
; OUTBUF POINTER
; TRANSDUCER ID
; SAMPLE ID

```

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58	000262	BLKW	78.	TIME WINDOWS
59	000362	BLKW	32.	TIME WINDOW TYPES
60	000372	BLKW	8.	COORDINATES OF INPUT POINT - SET BY EACH
61	000376	BLKW	1.	COORDINATES OF WINDOW TO BE PLOTTED IN DATA UNITS
62	000400	WORD		WINDOW TYPE FOR PLTW
63	000400	WORD		CHARACTER INTERNES WITH FIRST WINDOW POINT
64	000402	WORD		
65	000404	WORD		
66	000406	WORD		
67	000410	WORD		
68	000412	WORD		
69	000414	WORD		
70	000000	CSECT	SCNCOM	
71	000000	WORD		
72	000002	WORD		
73	000004	WORD		
74	000006	WORD		
75	000010	WORD		
76	000012	WORD		
77	000014	WORD		
78	000016	WORD		
79	000034	WORD		
80	000034	WORD	30.	
81	000132	WORD	10.	
82	000132	CSECT	NTRCOM	
83	000000	WORD		
84	000000	WORD		
85	000002	WORD		
86	000004	WORD		
87	000006	WORD		
88	000010	WORD		
89	000010	CSECT	ATPARA	
90	000000	ADLY1:		
91	000002	ADLY1:		
92	000004	ADLY2:		
93	000006	ADLY3:		
94	000010	ADLY3:		
95	000012	ADLY3:		
96	000014	ADLY3:		
97	000016	ADLY3:		
98	000020	ADLY3:		
99	000022	ADLY3:		
100	000024	ADLY3:		
101	000026	ADLY3:		
102	000030	ADLY3:		
103	000032	ADLY3:		
104	000034	ADLY3:		
105	000036	ADLY3:		
106	000040	ADLY3:		
107	000042	ADLY3:		
108	000044	ADLY3:		
109	000046	ADLY3:		
110	000050	ADLY3:		
111	000052	ADLY3:		
112	000054	ADLY3:		
113	000056	ADLY3:		
114	000060	ADLY3:		

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BEGXC RT1-11 MACRO VM02-12 21-NOV-79 PAGE 24

ADDRESS	DATA	DESCRIPTION
115	000000	BSFL: 0
116	000000	ACNTR: 0
117	000000	BCNTR: 0
118	000000	AAPC: 2
119	000002	ABPC: 2
120	000002	AAPC: 2
121	000002	ABPC: 2
122	000000	ANRG: 0
123	000000	BRGC: 0
124	000000	AOFFS: 0
125	000000	HOFFS: 0
126	000001	ACNH: 1
127	000000	BCNH: 0
128	000001	APOL: 1
129	000000	DPOL: 0
130		;
131		;
132		;
133		;
134		;
135	000000	COMMON IBUF
136	000000	IBUF
137	000000	IBUF
138	000000	IBUF
139	000000	IBUF
140	000000	IBUF
141	000000	IBUF
142	000000	IBUF
143	000000	IBUF
144	000000	IBUF
145	000000	IBUF
146	000000	IBUF
147	000000	IBUF
148	000000	IBUF
149	000000	IBUF
150	000000	IBUF
151	000000	IBUF
152	000000	IBUF
153	000000	IBUF
154	000000	IBUF
155	000000	IBUF
156	000000	IBUF
157	000000	IBUF
158	000000	IBUF
159	000000	IBUF
160	000000	IBUF
161	000000	IBUF
162	000000	IBUF
163	000000	IBUF
164	000000	IBUF
165	000000	IBUF
166	000000	IBUF
167	000000	IBUF
168	000000	IBUF
169	000000	IBUF
170	000000	IBUF
171	000000	IBUF
172	000000	IBUF
173	000000	IBUF
174	000000	IBUF
175	000000	IBUF
176	000000	IBUF
177	000000	IBUF
178	000000	IBUF
179	000000	IBUF
180	000000	IBUF
181	000000	IBUF
182	000000	IBUF
183	000000	IBUF
184	000000	IBUF
185	000000	IBUF
186	000000	IBUF
187	000000	IBUF
188	000000	IBUF
189	000000	IBUF
190	000000	IBUF
191	000000	IBUF
192	000000	IBUF
193	000000	IBUF
194	000000	IBUF
195	000000	IBUF
196	000000	IBUF
197	000000	IBUF
198	000000	IBUF
199	000000	IBUF
200	000000	IBUF
201	000000	IBUF
202	000000	IBUF
203	000000	IBUF
204	000000	IBUF
205	000000	IBUF
206	000000	IBUF
207	000000	IBUF
208	000000	IBUF
209	000000	IBUF
210	000000	IBUF
211	000000	IBUF
212	000000	IBUF
213	000000	IBUF
214	000000	IBUF
215	000000	IBUF
216	000000	IBUF
217	000000	IBUF
218	000000	IBUF
219	000000	IBUF
220	000000	IBUF
221	000000	IBUF
222	000000	IBUF
223	000000	IBUF
224	000000	IBUF
225	000000	IBUF
226	000000	IBUF
227	000000	IBUF
228	000000	IBUF
229	000000	IBUF
230	000000	IBUF
231	000000	IBUF
232	000000	IBUF
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245	000000	

SYMBOL TABLE

AANC	000074R	006	AAPC	000070R	006	ABMC	000076R	006	ABPC	000072R	006	ACHN	000110R	006
ACNT	000054R	006	ACNTR	000064R	006	ACOUF	000050R	006	ADLY1	000000R	006	ADLY2	000004R	006
ADLY3	000010R	006	ADLY4	000040R	006	ALEVS	000014R	006	ALEV1	000020R	006	ALEV2	000024R	006
ADHDE	000030R	006	AOFFS	000104R	006	APOL	000114R	006	ARNG	000100R	006	ASEL	000060R	006
ASLOP	000044R	006	ASRC	000034R	006	BCHN	000112R	006	BCNTR	000066R	006	BGIN1	000032R	006
BECCX	000000R	006	BLKNT	000070R	006	BLKNUM	000066R	006	BOFFS	000024R	006	EPOL	000116R	006
BRNG	000102R	006	BSEL	000062R	006	CHNUM	000064R	006	COFFS	000020R	006	CRNG	000030R	006
DIL	000132R	006	DFBUF	000042R	006	DFLT	000030R	006	DTYPE	000000R	006	DURY	000032R	006
DXNIN	000132R	006	FBL	000014R	006	FBNTR	000022R	006	FBUF	000016R	006	FIN	000032R	006
FSTAT	000054R	006	FSTAT1	000056R	006	IBUF	000034R	006	IDTH	000066R	006	IEDREQ	000022R	006
IENR	000012R	006	IOFFSC	000014R	006	IRNG	000034R	006	ISTREQ	000020R	006	ITYP	000004R	006
IUTS	000000R	006	IWDSTR	000016R	006	LSINT	000022R	006	MAXX	000004R	006	MAXY	000010R	006
NINX	000002R	006	MINY	000006R	006	MODE	000010R	006	OBNT2	000076R	006	PC	0000007	006
PNT	000372R	006	RBUF	000004R	006	RENT2	000000R	006	RENT2	000006R	006	PC	0000007	006
R0	0000000	006	RI	0000001	006	RENT2	0000002	006	R3	0000003	006	R4	0000004	006
R5	0000005	006	SPLID	000106R	006	R2	0000002	006	SP	0000006	006	SNCHTP	000002R	006
SSACT	000010R	006	STARTX	000002R	006	SOURCE	000000R	006	STOPX	000004R	006	TCNT	000056R	006
TUOUP	000052R	006	TDLY1	000002R	006	STATUS	000034R	006	TDLY3	000012R	006	TEKIN	000026R	006
THXCD	000074R	006	TISRC	000042R	006	TDLY2	000006R	006	TLEV1	000022R	006	TLEV2	000036R	006
THNDE	000032R	006	TSLOP	000046R	006	TLEVS	000016R	006	TWNT	000026R	006	TWNT	000010R	006
TXI	000004R	006	TX2	000012R	006	TSRC	000036R	006	TY2	000014R	006	TZ1	000020R	006
TZ2	000016R	006	WCHAR	000414R	006	TY1	000006R	006	XDCRID	000100R	006	XH1	000020R	006
XLO	000016R	006	XWDTH	000376R	006	WTP	000412R	006	XWL	000402R	006	X9	000012R	006
YHCTH	000400R	006	YH1	000024R	006	XWH	000406R	006	YMH	000410R	006	YWL	000404R	006
Y0	000014R	006				YLO	000022R	006						
Y1	000000	006												
Y2	000056	006												
Y3	000130	006												
Y4	000416	006												
Y5	000134	006												
Y6	000012	006												
Y7	000120	006												
Y8	010034	006												

ERROR DETECTED: 0  
FILE CORE: 16774. WORDS

.DK1: BECCX/R: TTN/E: LG=BECCX

**F-15**

BALL RT-11 MACRO VHS2-12 21-NOV-79 PAGE 1+  
SYMBOL TABLE

BALL	000000RC	BNSC	000072R	CHOUT = ***** C	ECHO	000234R	ICHOEF	000000R	002
IN	000022R	NSCE	000234R	NUM = 000002	NUM1	= 000046	OUTCH	000242R	
PC	=X000007	R0	=X000000	R1 =X000001	R2	=X000002	R3	=X000003	
R4	=X000004	R5	=X000005	SNPLID 000106R	004	SP	XDCRID	000006R	003
XDUCER	000012RC	XNSC	000150R						
. ABS.	000000		000						
	000244		001						
TEKCOM	000002		002						
XCOM	000014		003						
RCOM	000114		004						

ERRORS DETECTED: 0  
FREE CORE: 16064. WORDS

.DK1: BALL/N: TTR/E: LC=BALL

BATDLY

; ARM AND TRIGGER RT-11 MACRO V02-12 21-NOV-79 PAGE 1

```

1  .TITLE BATDLY ; ARM AND TRIGGER DELAY COMMANDS
2  .GLOBL ADLY,TDLY,ACHD,TCID
3  .GLOBL ARM,TRIGER
4  .GLOBL FLCT,TTRER
5  .MCALL SAVE,UNSAVE,.RECDEF
6  .RECDEF
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8  000000
9  000000
10 000000
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ADLY: 012746 175000 ; ALM, -(SP) ; LEVEL MAGNITUDE COMMAND  
012746 174000 ; ADH1, -(SP) ; DELAY MAGNITUDE COMMAND(HSB)  
000410 174000 ; ADH23, -(SP) ; DELAY MAGNITUDE COMMAND(LSB)  
BR ATD ; TRIGGER FUNCTIONS

TDLY: 012746 172000 ; TLM, -(SP)  
012746 176000 ; TDH1, -(SP)  
012746 176000 ; TRF23, -(SP)  
016504 000000 ; 4(R3), R4  
012337 000000 ; 2(R5), 2\*CTREG ; ENABLE THE APPROPRIATE GROUP  
004767 000000 ; PC, FLCT ; WAIT  
016400 000000 ; 4(R4), R0 ; GET LSB OF DELAY  
072037 000000 ; #4, R0 ; SHIFT INTO POSITION  
050016 000010 ; R0, (SP) ; INSERT IN COMMAND  
056416 000010 ; 19(R4), (SP) ; INSERT NEXT HSB  
012337 164012 ; (SP)+, 2\*CTREG ; CHIP OUT THE COMMAND  
004767 000000 ; PC, FLCT ; WAIT  
051416 000000 ; (R4), (SP) ; SET ESB OF DELAY  
012337 164012 ; (SP)+, 2\*CTREG ; CHIP IT OUT  
004767 000000 ; PC, FLCT ; WAIT  
016130 000000 ; 20(R4), R0 ; GET LEVEL MAGNITUDE  
072037 000000 ; #4, R0 ; SHIFT  
056416 000000 ; 24(R2), (SP) ; GET LEVEL MAGNITUDE HSB  
00167 000112 ; DONE ; FINISH IN COMMON CODE

ACHD: 012746 175000 ; APB, -(SP)  
000000 000000 ; R0  
000000 000000 ; ATC  
000000 000000 ; R0, -(SP)  
000000 000000 ; R4, -(SP)  
000000 000000 ; TPB, -(SP)  
000000 000000 ; 2200, R0  
000000 000000 ; 4(R5), R4  
000000 000000 ; 2(R5), 2\*CTREG ; SET FRONT PANEL TO DIGITAL  
000000 000000 ; PC, FLCT ; WAIT  
000000 000000 ; (R4), R0 ; GET MODE  
000000 000000 ; 2, R0 ; POSITION  
000000 000000 ; 4(R3), R0 ; ADD IN SOURCE  
000000 000000 ; R0 ; POSITION FOR NEXT ITEM  
000000 000000 ; 10(R4), R0 ; ADD IN INPUT SOURCE  
000000 000000 ; R0 ; POSITION FOR NEXT ITEM  
000000 000000 ; 14(R4), R0 ; ADD IN SLOPE  
000000 000000 ; R0

TCID: 012746 000000 ; TLM, -(SP)  
000000 000000 ; TDH1, -(SP)  
000000 000000 ; TRF23, -(SP)  
000000 000000 ; 4(R3), R4  
000000 000000 ; 2(R5), 2\*CTREG ; ENABLE THE APPROPRIATE GROUP  
000000 000000 ; PC, FLCT ; WAIT  
000000 000000 ; 4(R4), R0 ; GET LSB OF DELAY  
000000 000000 ; #4, R0 ; SHIFT INTO POSITION  
000000 000000 ; R0, (SP) ; INSERT IN COMMAND  
000000 000000 ; 19(R4), (SP) ; INSERT NEXT HSB  
000000 000000 ; (SP)+, 2\*CTREG ; CHIP OUT THE COMMAND  
000000 000000 ; PC, FLCT ; WAIT  
000000 000000 ; (R4), (SP) ; SET ESB OF DELAY  
000000 000000 ; (SP)+, 2\*CTREG ; CHIP IT OUT  
000000 000000 ; PC, FLCT ; WAIT  
000000 000000 ; 20(R4), R0 ; GET LEVEL MAGNITUDE  
000000 000000 ; #4, R0 ; SHIFT  
000000 000000 ; 24(R2), (SP) ; GET LEVEL MAGNITUDE HSB  
000000 000000 ; DONE ; FINISH IN COMMON CODE

ATC: 012746 000000 ; APB, -(SP)  
000000 000000 ; R0  
000000 000000 ; ATC  
000000 000000 ; R0, -(SP)  
000000 000000 ; R4, -(SP)  
000000 000000 ; TPB, -(SP)  
000000 000000 ; 2200, R0  
000000 000000 ; 4(R5), R4  
000000 000000 ; 2(R5), 2\*CTREG ; SET FRONT PANEL TO DIGITAL  
000000 000000 ; PC, FLCT ; WAIT  
000000 000000 ; (R4), R0 ; GET MODE  
000000 000000 ; 2, R0 ; POSITION  
000000 000000 ; 4(R3), R0 ; ADD IN SOURCE  
000000 000000 ; R0 ; POSITION FOR NEXT ITEM  
000000 000000 ; 10(R4), R0 ; ADD IN INPUT SOURCE  
000000 000000 ; R0 ; POSITION FOR NEXT ITEM  
000000 000000 ; 14(R4), R0 ; ADD IN SLOPE  
000000 000000 ; R0

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

BATDLY

; ARM AND TRIGGER RT-11 MACRO VM02-12 21-NOV-79 PAGE 1+

```

58 000236 056400 000020      20(R4),R0      ;ADD IN COUPLING
59 000237 072027 000002      #2,R0        ;POSITION FOR NEXT ITEM
60 000238 056403 177764      BIS -14(R4),R0  ;ADD IN POLARITY
61 000239 050016 000000      BIS R0,(SP)    ;INSERT IN COMMAND
62 000240 012637 164042      NOV (SP)+,0*CTREG ;SHIP TO B8100
63 000241 004767 000000      JSR PC,FLCT    ;WAIT
64 000242 004767 000000      UNSAVE 40
65 000243 004767 000000      JSR PC,TIMER
66 000244 000207 000000      RTS PC
67 000245 000207 000000      ARM:
68 000246 012737 164420 164042  NOV ARMF,0*CTREG ;SEND ARM COMMAND
69 000247 004767 000000      JSR PC,FLCT
70 000248 000207 000000      RTS PC
71 000249 000207 000000      TRIGGER:
72 000250 012737 164410 164042  NOV TRIGF,0*CTREG ;SEND TRIGGER COMMAND
73 000251 004767 000000      JSR PC,FLCT
74 000252 000207 000000      RTS PC
75 000253 164042 000000      CTREG = 164042
76 000254 164100 000000      ARMCP = 164100
77 000255 164200 000000      TRICP = 164200
78 000256 164320 000000      ARMF = 164320
79 000257 164410 000000      TRIGF = 164410
80 000258 175400 000000      APB = 175400
81 000259 177400 000000      TPB = 177400
82 000260 175000 000000      ALH = 175000
83 000261 177000 000000      TLN = 177000
84 000262 174400 000000      ADM1 = 174400
85 000263 176400 000000      TDH1 = 176400
86 000264 174000 000000      ADM23 = 174000
87 000265 176000 000000      TDH23 = 176000
88 000266 000001 000000      .END

```

BATDLY SYM/OL TABLE 1 ARH AND TRIGGE RT-11 MACRO VHS2-12 21-NOV-79 PAGE 1+

ACMD = 003162RG  
 APB = 175466  
 ATD = 000042R  
 R0 = X000000  
 R5 = X000000  
 T0M13 = 175466  
 TRIGER 000312RG  
 . AND. 000000  
 001  
 ERROR DETECTED: 0  
 FIRST CODE: 1024. WORD3

ADLY 000000RG  
 ARH 000276RG  
 CTREG = 164042  
 R1 = X000001  
 SP = X000006  
 TIMER = \*\*\*\*\* G  
 TRIGF = 164410

ADN1 = 174430  
 ARMF = 164420  
 DONE 000252R  
 R2 = X000002  
 TCMD 000154RG  
 TLM = 177000

ADH23 = 174000  
 ARMP = 164100  
 FLGT = \*\*\*\*\* G  
 R3 = X000003  
 TDLY 000022RG  
 TPB = 177400

ALN = 175000  
 ATC 000170R  
 PC = X000007  
 R4 = X000004  
 T0M1 = 176400  
 TRIGP = 164300

.DK1:BATDLY/H:TRH/E:LC=BATDLY

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR

```

1  TITLE DISPXC
2  .CLOHL XCAXIS, CPLOT, HOME, DISPXC, FPLOT, IPLOT, PATH, PRTV, ALPHA, ERASE, CROUT
3  .MCALL .RECDEF
4  .RECDEF
5  NDBY
6  DTTYPE
7  DT1
8  $IBUF, ADATA
9  STARTX, MINX
10 STARTX, ADATA
11 STOPX, MAXX
12 STOPX, N
13 STARTX, N
14 N
15 INRG, R2
16 R2
17 MAXX, R1
18 TSS(R2), R1
19 R1, MAXX
20 TBRK(R2), NDBX
21 $L5, AIBUF
22 $B, N1
23 $320, IX
24 $680, IY
25 IUTS, R1
26 TBR(R1), L3
27 $358, IX1
28 $0, IY1
29 $L3, AIBUF2
30 $B, N2
31 $L1, AIBUF
32 $6, IX2
33 $525, IY2
34 $10, N3
35 OUT
36 DTTYPE, #1
37 DT1, 2
38 PC, ERASE
39 PC, HOME
40 $PCT, N3
41 $4, R2
42 R2, PNUM
43 PC, XCAXIS
44 SPEAK, R0
45 (R3), R0
46 $10, R0
47 R0, CTTHRES
48 (R3)+, R0
49 $3060, R0
50 R0, PCINT+6
51 PC, CPLOT
52 R2, DT1, 1
53 $P, ICHBUF
54 FIN2
55 PC, ERASE
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DISPATCH RT-11 НАЧНО 1133-13

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100

```

.CSECT DSPCOM
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.WORD 84.
.WORD 0
.WORD 0
.WORD 0
.CSECT HTRCOM
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.CSECT XEXOH
.WORD 2
.WORD 0
.WORD 4
.WORD 0
.WORD 7
.PCNT,PCNTE,< % >
.WORD 23.
.WORD 0
.CSECT TEKCOM
.WORD 0
.END

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR





	.CSECT	ATPARA
57	0000000*	
58	0000000	
59	0000000	
60	0000000	
61	0000002	ADLY1:
62	0000004	TDLY1:
63	0000006	ADLY2:
64	0000010	TDLY2:
65	0000012	ADLY3:
66	0000014	TDLY3:
67	0000016	ALEVS:
68	0000020	ALEV1:
69	0000022	TLEV1:
70	0000024	ALEV2:
71	0000026	TLEV2:
72	0000030	ANODE:
73	0000032	TNODE:
74	0000034	ASRC:
75	0000036	TSRC:
76	0000040	AISRG:
77	0000042	TISRG:
78	0000044	ASLOP:
79	0000046	TSLOP:
80	0000050	ACOUF:
81	0000052	TCOUP:
82	0000054	ACNT:
83	0000056	TCNT:
84	0000060	ASEL:
85	0000062	BSEL:
86	0000064	ACNTR:
87	0000066	BCNTR:
88	0000070	AAPG:
89	0000072	ABPC:
90	0000074	AAMG:
91	0000076	ABMG:
92	0000080	AARG:
93	0000082	BRNG:
94	0000084	BOFFS:
95	0000086	BOFFS:
96	0000090	ACHH:
97	0000092	BCHH:
98	0000094	APOL:
99	0000096	EPOL:
100		:
101		:
102		:
103		:
104		:
105	0000000*	
106	0000000	IUTS:
107	0000002	IRNG:
108	0000004	ITYP:
109	0000006	IDTH:
110	0000010	KODE:
111	0000012	IEUR:
112	0000014	IOFFSC:
113	0000016	IWDSTR:

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

EGETUP RT-11 MACRO V02-12 21-NOV-79 PAGE 14

114	000029	000000	ISTREC:	0
115	000022	000000	LENG:	0
116	000024	000000	CONF:	0.0
117	000030	000000	GRNG:	0.0
118	000034	000000	IDUF:	.BLKW 2048.
119		000001		.END

BSETUP RT-11 MACRO VM02-12 21-NOV-79 PAGE 1+

SYMBOL TABLE

AAPC	000074R	002	AAPC	000070R	002	ABWC	000076R	002	ABPC	000072R	002	ACHM	000110R	002
ACND	***** G		ACNT	000054R	002	ACNTR	000064R	002	ACUP	000050R	002	ADLY	***** G	002
ADLY1	000000R	002	ADLY2	000004R	002	ADLY3	000010R	002	AISC	000040R	002	ALEV	000014R	002
ALEV1	000020R	002	ALEV2	000024R	002	ANODE	000030R	002	AIFS	000104R	002	APOL	000114R	002
ARR1	***** G		ARR2	000100R	002	ASSEL	000060R	002	ASLOP	000044R	002	ASRC	000034R	002
BNN	000112R	002	BNNR	000066R	002	BOFFS	000106R	002	BPOL	000116R	002	BRESET	***** G	003
BNG	000102R	002	BSEL	000050R	002	BSETUP	000000R	002	CBUF	000034R	003	COFFS	000024R	003
CRNG	000030R	003	CTHCP	000050R	003	FLGT	***** G	003	IBUF	000002R	003	IDTH	000006R	003
IFDREC	000022R	003	IERR	000012R	003	IOFFSC	000014R	003	IRHC	000002R	003	ISTREC	000020R	003
ITYP	000034R	003	IUTS	000000R	003	IWDSTR	000016R	003	MODE	000010R	003	OVTM	***** G	003
PC	***** G		RECDN	***** G		RT	000034R	003	R0	***** G		R1	***** G	003
R2	***** G		R3	***** G		R4	***** G	003	R5	***** G		SETCA	***** G	003
SETCB	***** G		SETA	***** G		SETIB	***** G	003	SETHA	***** G		SETNB	***** G	003
SP	***** G		TCHD	***** G		TUNT	000056R	002	TCHUP	000052R	002	TDLY	***** G	002
TDLY1	000002R	002	TDLY2	000006R	002	TDLY3	000012R	002	T1	0000450R	002	TIMER	***** G	002
TISRC	000042R	002	TLEVS	000016R	002	TLEVI	000022R	002	TLEV2	000026R	002	TMBASE	***** G	002
TMODE	000032R	002	TRIGER	***** G		TSLOP	000046R	002	TSRC	000036R	002			
.ABS.	000000	000												
ATPARA	000052	001												
IDUF	000120	002												
G1C34	000034	003												

ERRORS DETECTED: 0

FREE CORE: 16872. WORDS

.DK1: RSET3/N: TTM/E: LC=BSET3



58 000310	026727	000000	000104	CNT5:	CMP	ICHRUF, #104	
59 000316	001070				BNE	CNT6	
60 000320	012767	077777	000016		MOV	#77777, XLO	
61 000326	012767	177777	000020		MOV	#177777, XHI	
62 000334	012767	000016	000022		MOV	XLO, YLO	
63 000342	012767	000020	000024		MOV	XHI, YHI	
64 000350	005067	000032			CLR	MINX	
65 000354	005067	000004			CLR	MAXX	
66 000360	005067	000000			CLR	ICHRUF	
67 000364	004767	000000			JSR	PC, ERASE	
68 000370	004767	000000			JSR	PC, NONE	
69 000374	012705	001154			MOV	#DCR, R5	
70 000400	004767	000000		13:	JSR	PC, CHOUT	
71 000404	005767	000000			TST	ICHRUF	
72 000410	001775				BEQ	18	
73 000412	016767	000000	000532		MOV	ICHRUF, DSP+6	
74 000420	016767	000000	000000		MOV	ICHRUF, DTYPE	
75 000426	005067	000030			CLR	ICHRUF	
76 000432	162767	000050	000000		SUB	#60, DTYPE	
77 000440	002761				BLT	18	
78 000442	026727	000000	000001		CMP	DTYPE, #1	
79 000450	003355				BGT	18	
80 000452	001004				BNE	38	
81 000454	004767	000000			JSR	PC, D1	
82 000460	005067	000020			CLR	ICHRUF	
83 000464	012705	001144		38:	MOV	#DSP, R5	
84 000470	004767	000000			JSR	PC, CHOUT	
85 000474	000167	000374			JMP	NXTFNC	
86 000500	026727	000000	000132	CNT6:	CMP	ICHRUF, #132	
87 000506	001032				BNE	CNT7	
88 000510	016767	000000	000000		MOV	ICHRUF, RENTR	
89 000516	005767	000002			TST	LBLUP	
90 000522	001407				BEQ	18	
91 000524	005767	000000			TST	DTYPE	
92 000530	001004				BNE	18	
93 000532	026767	000002	000004		CMP	MINX, MAXX	
94 000540	001004			18:	BNE	28	
95 000542	005067	000000			CLR	DTYPE	
96 000546	000167	000370			JMP	OUT	
97 000552	004767	000000		28:	JSR	PC, ZOOM	
98 000556	005767	000000			TST	RENTR	
99 000562	001402				BEQ	998	
100 000564	000167	000352			JMP	OUT	
101 000570	000167	000300		998:	JMP	CNT9	
102 000574	026727	000000	000127	CNT7:	CMP	ICHRUF, #127	
103 000602	001034				BNE	CNT8	
104 000604	016767	000000	000000		MOV	ICHRUF, RENTR	
105 000612	026727	000000	000000	48:	CMP	DTYPE, #0	
106 000620	001405				BEQ	52	
107 000622	012767	000000	000000		MOV	#0, DTYPE	
108 000630	000167	000306			JMP	OUT	
109 000634	026767	000002	000004	58:	CMP	MINX, MAXX	
110 000642	001410				BEQ	38	
111 000644	005767	000002			TST	LBLUP	
112 000650	001405				BEQ	38	
113 000652	004767	000000			JSR	PC, TWINDO	
114 000656	005767	000000			TST	RENTR	

;CHECK DISPLAY CONTROL REQUESTED (B)

;PRINT DISPLAY REQUEST  
;WAITFOR INPUT

;CHECK ZOOM REQUESTED

;CHECK WINDOW REQUESTED



```

171 001376
172 001404
173 001446
174 001502
175 001532
176 001562
177 001570
178 001606
179 001624
180 001670
181 001676
182 001744
183 001776
184 002030
185 002056
186 002106
187 002140
188 002170
189 002220
190 002256
191 002322
192 002340
193 002360
194 002374
195 000000
196 003060
197 003082
198 000000
199 003000
200 003002
201 003004
202 003006
203 003010
204 000000
205 003000
206 003002
207 003004
208 000000
209 003016
210 003020
211 003022
212 003024
213 000000
214 003000
215 003002
216 000000
217 003034
218 000000
219 003060
220 003062
221 000000
222 000000
223 000142
224 000144
225 000001

```

```

CHSTUP  SCR,PSE
CHTXT   <SCANNER CONTROL INITIATED >
CHTXT   <SELECT INPUT SOURCE >
CHTXT   <1=REAL TIME DATA>
CHTXT   <2=RECORDED DATA >
CHSTUP  PSE,NXF
CHTXT   <PAUSE >
SUPTXT  NXF,HLP,<>
CHTXT   <SELECT NEXT CONTROL FUNCTION>
CHSTUP  HLP,END
CHTXT   <FUNCTIONS CURRENTLY AVAILABLE >
CHTXT   <S=SCANNER CONTROL >
CHTXT   <D=DISPLAY CONTROL >
CHTXT   <Z=ZOOM CONTROL>
CHTXT   <W=WINDOW CONTROL>
CHTXT   <T=TRIGGER CONTROL >
CHTXT   <R=DATA RECORDING>
CHTXT   <I=INPUT CONTROL>
CHTXT   <B=BALL IDENTIFICATION>
CHTXT   <X=TRANSDUCER IDENTIFICATION>
CHTXT   <E=EXIT>
CHTXT   <P=PAUSE >
CHTXT   <G=GO>
      .WORD 0
      .CSECT TEKCON
      .WORD 0
      .CSECT NTRCON
      .WORD 0
      .CSECT DSPCON
      .WORD 0
      .CSECT SCHCON
      .WORD 0
      .BLKW 4
      .WORD 0
      .WORD 0
      .WORD 0
      .WORD 0
      .CSECT SCHCON
      .WORD 0
      .BLKW 12
      .WORD 0
      .CSECT RCDCON
      .BLKW 24
      .WORD 1
      .WORD 2
      .BLKW 23
      .WORD 0
      .WORD 0
      .END
END:
ICHBUF:
LELUP:
RENTX:
STOPX:
RENT2:
SSACT:
DTYPE:
MINX:
MAXX:
XLO:
XHI:
YLO:
YHI:
SOURCE:
SRCHTP:
STATUS:
ICINUM:
RCINUM:
RSTART:
RSTOP:

```

WRITE CHANNEL NUMBER  
READ CHANNEL NUMBER

SYMBOL TABLE

BALL = ***** G	BECKC = ***** G	CHOUT = ***** G	CNTRXC	CNTI	000000R
CNT10 000734R	CNT11 000734R	CNT12 001000R	CNT13	CNT14	001050R
CNT15 001074R	CNT2 000066R	CNT3 000224R	CNT4	CNT5	000310R
CNT6 000300R	CNT7 000574R	CNT8 000674R	CNT9	CNT99	001074R
DCR 001154R	DSETUP= ***** G	DSP 001144R	DTYPE	DUMP = ***** G	
D1 = ***** G	ERD 000974R	ERASE = ***** G	FCLAGE=	HLP	001670R
HORE = ***** G	ICHBUF 000900R	IRXCO = ***** G	LELUP	MAX	000004R
NIRX 001142R	RUN = 000001	NUM1 = 000004	NXP	NXTFNC	001074R
OUT 001142R	PC 0000007	PSE 001562R	RENTR	RENTR	000000R
RENT12 00066R	R3 00132R	R4 000004	R1	R1	0000001
R2 = 000002	R3 000003	R4 000004	SCR	SCR	001376R
SOURCE 000000R	SP 0000006	SRCHTP 000002R	STARTX	STARTX	000002R
STATUS 000034R	STOPX 000004R	SI = ***** G	TC	TC	000000R
TERM 001926R	TWIND= ***** G	YCHNUM 000000R	XHI	XHI	000000R
XLO 000016R	YHI 000924R	YLO 000022R	...V2 =	...V2 =	0000001

ABS. 000000  
 002376  
 TEKCON 000004  
 NTRCON 000012  
 DSPCON 000026  
 SCRTCH 000036  
 RCHCON 000146  
 ERROR3 DETECTED: 0  
 FREE CORE: 16292. VORR3

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR



58	000000	012757	000000	000020	BACK:	MOV	#2,P31	:POINT STATUS = 2
59	000000	012758	000020		B1:	MOV	#SFBP+100.,R0	:SFBP ALREADY BE THERE
60	000012	020027	000156			CMP	R0,#SFBP	:CHECK FOR END OF BACK PROCESSING
61	000016	010154				BLOS	FT2	:SEARCH BACK FOR NON-ZERO
62	000020	105740				TSTB	-(R9)	
63	000022	001773				BEQ	B1	
64	000024	010091				MOV	R0,R1	:GET Y VALUE (ROW #)
65	000026	162701	000156			SUB	#SFBP,R1	
66	000028	010167	000022			MOV	R1,PBY	:GET FRONT POINT
67	000030	116167	000024			MOV	PPOINT(R1),FP	:GET FRONT POINT
68	000032	116167	000026			MOV	BPOINT(R1),BP	:GET BACK POINT
69	000034			B2:				
70	000036	012757	000091	000150	B3:	MOV	#1,SINFLC	:GET ROW #
71	000038	016704	000022			MOV	PBY,R4	:CHECK FOR FIRST POINT
72	000040	020427	000114			CMP	R4,#100.	
73	000042	001413				BEQ	IS	:CHECK LAST POINT STATUS
74	000044	105764	000157			TSTB	SFBP+1(R4)	
75	000046	001410				BEQ	IS	
76	000048	116495	000467			MOV	BPOINT+1(R4),R3	:GET LAST BACK
77	000050	166705	000626			SUB	BP,R5	:GET DIFFERENCE
78	000052	002403				BLT	IS	:DECREASING, SCAN LAST
79	000054	005204				INC	R4	
80	000056	005457	000150			NEG	SINFLC	
81	000058	001757	000022		I3:	JSR	PC,SINFLC	:INSERT POINT
82	000060	001757	000022		B4:	JSR	PC,INSP	:CHECK FOR END OF BACK
83	000062	020627	000156			CMP	R0,#SFBP	
84	000064	101685				BLOS	FT2	:CHECK NEXT POINT
85	000066	105740				TSTB	-(R0)	:IF ZERO, GAP.
86	000068	001724				BEQ	B1	
87	000070	010091				MOV	R0,R1	:GET OFFSET
88	000072	162701	000156			SUB	#SFBP,R1	:SAVE Y COORDINATE
89	000074	010167	000022			MOV	R1,PBY	:GET FRONT POINT
90	000076	116167	000024			MOV	PPOINT(R1),FP	:GET FRONT POINT
91	000078	116167	000466	000026		MOV	BPOINT(R1),BP	:GET BACK POINT
92	000080				B5:			
93	000082	116702	000026		B6:	MOV	BP,R3	:GET LAST POINT
94	000084	116163	000467			MOV	BPOINT+1(R1),R3	:GET DIFFERENCE
95	000086	160302				SUB	RS,R2	
96	000088	002091				INC	IS	
97	000090	005492				DEC	R2	:CHECK FOR CONTINUITY
98	000092	002027	000021		I3:	CMP	I2,#1	:CONTINUOUS
99	000094	003744				BLE	B4	:DISCONTINUOUS
100	000096	000716				BR	B3	

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

**F-36**

CPLOT RT-11 MACRO VR32-12 21-NOV-79 PAGE 24  
SYCOL TABLE

[illegible]

6 46479434 200003  
200 32910 10 DK  
200 32910 10 DK

**DKI:CPLOT/N:TIME:AX=CPLOT**

```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

```

.TITLE COMBSP  
 ROUTINE TO DISPLAY DESIRED DATA ON CONSOLE WHILE JMS IS RUNNING  
 THE CONDITION OF THE SWITCH REGISTER DETERMINES WHAT IS TO BE DISPLAYED  
 THERE ARE TWO MODES OF OPERATION:  
 I. COMMON MODE  
 A. BITS 13-15 DETERMINE WHICH COMMON IS TO BE DISPLAYED  
 THESE ARE LISTED BELOW:  
 0) DBCCOM - DEBUG COMMON  
 1) SCRCOM - SCAN COMMON  
 2) XCCOM - TRANSFER COMMON  
 3) NTRCOM - INTRINSIC ROUTINE COMMON  
 4) IBUF - DATA BUFFER COMMON  
 5) DSPCOM - DISPLAY COMMON  
 6) ATTARA - DIAGNOSTIC COMMON  
 7) RDCOM - RECORD COMMON  
 B. BITS 0-12 DETERMINE THE OFFSET IN THE SELECTED COMMON  
 THIS IS ALWAYS A WORD OFFSET (EVEN NUMBERS ONLY)  
 ABSOLUTE HAVE  
 IF BIT 0 IS SET (NUMBER IS ODD). THE WORD DISPLAYED IS  
 AT THE ABSOLUTE ADDRESS INDICATED BY THE SWITCHES MINUS 1.

```

        .CLOCK COMBSP  

        .RECALL .RECEDEF  

        .SAVE  

        MOV 01 177570, R0  

        BIT 1, R0  

        ABSBSP  

        ASHG 1-13, R0  

        ASL 1-3, R1  

        NO  

        BIC 177760, R0  

        BIC 160990, R1  

        ADD COMADR(R0), R1  

        MOV 04, -1(SP)  

        MOV TRP, 04  

        MOV (R1), 0177570  

        MOV (SP)+, 04  

        OUT 10  

        URSAVE  

        RTS PC  

        ABSBSP: BIC  

        MOV 000001  

        MOV 00004  

        MOV 000121  

        MOV 177570  

        TRP:  

        RTI  

        COMADR: .WORD  

        DBCCOM, SCRCOM, XCCOM, NTRCOM, IBUF, DSPCOM, ATTARA, RDCOM  

        BRCCOM: .CSECT  

        .BLKW 1  

        SCRCOM: .CSECT  

        .BLKW 1  

        XCCOM: .CSECT  

        .BLKW 1  

        NTRCOM: .CSECT  

        .BLKW 1
    
```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

CONDEP RT-11 MACRO VM02-12 21-NOV-79 PAGE 14

37 000000	NTRCON:	.BLKW	1
38 000000	IBUF:	.CSECT	1
39 000000	DSPCOM:	.BLKW	1
40 000000	ATPARA:	.CSECT	1
41 000000	RCDCOM:	.BLKW	1
42 000000		.CSECT	1
43 000000		.BLKW	1
44 000000		.CSECT	1
45 000000		.BLKW	1
46 000000		.END	

SYMBOL TABLE

ALNDSP 000074R	007	ATPARA 000000R	010	COMADR 000122R	CONDSP 000000R	DECCOM 000000R	002
DSPCOM 000000R	011	IBUF 000000R	006	NTRCOM 000000R	OUT 000000R	PC =X000007	
RCDCOM 000000R	011	R0 =X000000		R1 =X000001	R2 =X000002	R3 =X000003	
R4 =X000004		R3 =X000005		SCNCOM 000000R	SP 000000	TRP 000120R	
XCCOM 000000R	004						
. AIS.	000						
	001						
DECCOM 000002	002						
SCNCOM 000002	003						
XCCOM 000002	004						
NTRCOM 000002	005						
IBUF 000002	006						
DSPCOM 000002	007						
ATPARA 000002	010						
RCNCOM 000002	011						

ERRORS DETECTED: 0

FREE CORE: 16940. WORDS

.DK1:CONDSP/N:TTW/E:LC=CONDSPX

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

D1 RT-11 MACRO V032-12 21-NOV-79 PAGE 1

```

1
2
3
4 000000
5 000000 012705
6 000004 034767 000000
7 000010 005067 000000
8 000014 005767 000000
9 000020 001775
10 000022 016709 000000
11 000026 162709 000000
12 000032 002766
13 000034 029927 000000
14 000040 002353
15 000042 006800
16 000044 016067 000000
17 000052 016767 000000
18 000050 012705 000000
19 000054 004767 000000
20 000070 000000
21 000072 000001 000000
22 000100 000000
23 000102
24 000146
25 000202
26 000254
27 000304
28 000304 000000 000002 000020
29 000304 000000
30 000000
31
32 000132 000000
33 000001

```

```

TITLE D1
.GLOBL D1,CHOUT
.MCALL .REDEF,SUPTXT,CHTXT,CHSTUP
.REDEF
JSR #DESG,R5
PC,CHOUT
CLR ICHBUF
TST ICHBUF
DEQ 25
MOV ICHBUF,R0
SUB #50,R0
BLT 15
CLP R0,#3
DGE 15
ASL R0
MOV TBL(R0),LBLMIN
MOV ICHBUF,OUTCH
MOV #ECHO,R5
JSR PC,CHOUT
RTS PC
.NORD
.NORD
SUPTXT
CHTXT
CHTXT
CHTXT
.NORD 0,2,2000.
.CSECT TEKCON
.NORD 0
.CSECT XCON
.NLKW 49.
.NORD 0
.END

```

```

D1:
15:
25:

```

```

ECHO:
OUTCH:

```

```

ESGE:
TBL:

```

```

ICHBUF:

```

```

LBLMIN:

```

SYMBOL TABLE

CHOUT = ***** G									
LBLMIN 000142R	003	DSEC	000102R	D1	000000RG	ECHO	000072R	ICHBUF	000000R
PC =%000007		MSCE	000304R	NUM	= 000001	NUM1	= 000017	CUTCH	000100R
R4 =%000004		R0	=%000000	R1	=%000001	R2	=%000002	R3	=%000003
. A03. 000000	000	R5	=%000005	SP		TBL	000304R		
TTKCOH 000312	001								
XXXXH 000002	002								
XXXXH 000114	003								

ERRORS DETECTED: 0  
 FREE CORE: 16963. WORDS  
 .DK1:D1/N:TTIL/E:LC=D1



89	000000	000000	CLR	R2
90	000000	000412	MOV	#ECHO, R5
91	000010	000000	CLR	ICBUF
92	000014	000000	TST	ICBUF
93	000020	000000	BEQ	23
94	000022	000000	MOV	ICBUF, R3
95	000026	000000	SUB	#60, R3
96	000032	000000	BLT	13
97	000034	000007	CHF	R3, #7
98	000040	000000	BCT	13
99	000042	000000	MOV	ICBUF, OUTCHR
100	000046	000000	JSR	PC, CROUT
101	000054	000015	ASH	#13, R3
102	000058	000003	ASHC	#3, R2
103	000064	000000	SUB	R4, 13
104	000066	000000	CLR	ICBUF
105	000072	000001	TST	R1
106	000074	000000	BNE	LINE3
107	000076	000000	JSR	PC, CRLF
108	000082	000000	MOV	R2, R1
109	000084	000000	CLR	ICBUF
110	000090	000000	BR	SCH2
111	000092	000000	.WORD	1, ECHO+4
112	000094	000000	.WORD	1
113	000096	000000	.BYTE	0
114	000100	000000	CHSTUP	DESC2, EDMSC2
115	000102	000000	CHTXT	<ENTER OCTAL ADDRESSES>
116	000104	000000	.BLKD	100.
117	000106	000000	.WORD	2
118	000108	000000	.WORD	VALUE
119	000110	000000	.WORD	0
120	000112	000000	.WORD	0
121	000114	000000	.WORD	SOURCE
122	000116	000000	.WORD	PEAK, OP, PO, POS, PD, DTYPE, RENTR
123	000118	000000	.WORD	ATDLY1, IUTS, IBUF, RON, OUTBUF
124	000120	000000	.WORD	ARRIVED
125	000122	000000	.WORD	GP-2, OP+298, PO+3070, POS+1534, PD+19998, WCHAR
126	000124	000000	.WORD	SSACT, EPOL, CRRC, IBUF+4096, -2
127	000126	000000	.WORD	OUTBUF-2, OUTBUF+512, -2
128	000128	000000	CHSTUP	DESC, EDMSC
129	000130	000000	CHTXT	<BUF OPTIONS>
130	000132	000000	CHTXT	<A-SCHCON BEFOR SEUF>
131	000134	000000	CHTXT	<B-NCOM BEFOR OP>
132	000136	000000	CHTXT	<C-OP>
133	000138	000000	CHTXT	<D-PO>
134	000140	000000	CHTXT	<E-POS>
135	000142	000000	CHTXT	<F-PD>
136	000144	000000	CHTXT	<G-DSPCON>
137	000146	000000	CHTXT	<H-NTRCOM>
138	000148	000000	CHTXT	<I-ATTATA>
139	000150	000000	CHTXT	

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

AALC	000074R	006	AAPC	000070R	006	ABPC	000072R	006	ACHH	000110R	006
ACHT	000054R	006	ACHR	000064R	006	ADLY2	000050R	006	ADLY3	000010R	006
ALSC	000040R	006	ALEVS	000014R	006	ALEV2	000020R	006	AMODE	000030R	006
ALDR	000036R	006	AOFFS	000104R	006	ARACT	000130R	006	ARIVED	000164R	002
ARUC	000100R	006	ASEL	000060R	006	ASLOP	000044R	006	ASAT	000030R	003
ATPOLY	000000R	006	BCHH	000112R	006	BCRTR	000056R	006	BP	000026R	003
BPOINT	000056R	003	BPOL	000116R	006	BRNG	000102R	006	BZACAL	000032R	003
BZD = ***** G			CRGUT = ***** G			CGFFS	000024R	007	CRG	000039R	007
CHINES	000016R	003	DASC	000073R	006	DASC2	000422R	006	DUPP	000000R	007
EDRO	000412R	003	EDFSC	001372R	003	EFNSC2	000456R	003	ERASE = ***** G		
FPV	000022R	003	FP	000024R	003	FPOINT	000312R	003	HO/E = ***** G		
IBUF	000024R	007	ICBUBF	000000R	011	IEFH	000005R	007	IERR	000012R	007
IBFNC	000014R	007	IRCED	000014R	003	IRNG	000002R	007	ISTREC	000020R	007
ITYP	000004R	007	IUTS	000000R	007	INDSTR	000016R	007	LINEO	000105R	005
LINE1	000124R	007	LIRE2	000170R	003	LPADR	000034R	003	HINX	000002R	003
MODE	000010R	007	NDRY	000250R	005	NUH	000002	010	OP	000146R	003
ORFT	000134R	003	OUT	000236R	003	OUT30F	000130R	010	PC	000007	003
PERT	000036R	003	PCHTE	000050R	003	PD	011622R	003	PEAK	000009R	003
FO	000022R	003	POFTR	000032R	003	POS	000622R	003	PSCNT	000144R	003
F31	000020R	003	REHTR	000000R	004	NENTR2	000005R	004	R0	0000000	
F4	0000001		R2	0000002		R3	0000003	004	R3	0000005	
SHRLE	000140R	003	SRDX	000276R	003	SFBP	000146R	003	SP	0000006	
SPEAK	000044R	003	SRCHT	000002R	002	SSACT	000010R	004	STARTX	000002R	004
STATES	000034R	002	STDPX	000004R	004	SZ2	000032R	002	TCCUP	000052R	006
TRAY1	000002R	006	TBLV2	000005R	006	TBLV3	000012R	005	TLEVS	000016R	006
TLEV1	000022R	006	TLEV2	000026R	006	TNDE	000032R	006	TSRC	000036R	006
TTCOF	000066R	002	TX1	000094R	002	T2	000012R	002	TY2	000014R	002
T4	000010R	002	TZ2	000016R	002	VALUE	000040R	003	YCRID	000006R	003
YFACT	000050R	003	XOFF	000054R	003	YFACT	000052R	003	YOFF	000056R	003

ALC3. 000000 000  
 001372 001  
 SCNCOH 000166 002  
 XCCOH 000662 003  
 NTRCON 000012 004  
 PTCOH 000416 005  
 APPARA 000120 006  
 LBOF 010034 007  
 RCHCOH 000130 010  
 TCHCOH 000002 011  
 ERRORS DETECTED: 0  
 FREE CORE: 16316. WORDS

, B.1: D0UPXK/R: TTL/E: LC: D0UPXK

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

;CALCULATE NEXT X

53 000304	066767	000074	000056	DEX, IX
59 000312	066767	000070	000056	DEXR, IYR
60 000320	026767	000052	000064	IYR, NI
61 000326	002405			IX
62 000330	166767	000056	000040	NI, IYR
63 000336	003267	000025		IX
64 000342	077340			R3, PLOOP
65 000344				PC
66 000356				UNSAVE
67 000360	000207	000370	000372	PCALL:
68 000366	000374			IX:
69 000370	000000			IY:
70 000372	000000			IP:
71 000376	000000			IYR:
72 000380	000000			DEY:
73 000402	000000			YSTRT:
74 000404	000000			DEX:
75 000406	000000			DEXR:
76 000410	000000			XSTRT:
77 000412	000000			NI:
78 000000				CSECT
79 000000				ESPCOM
80 000002	000000			DTYPE:
81 000004	000000			HINX:
82 000006	000000			HANX:
83 000010	000000			HINY:
84 000012	000000			HANY:
85 000014	000000			XO:
86 000016	000000			YO:
87 000020	000000			XLO:
88 000022	000000			XHI:
89 000024	000000			YLO:
90 000000				YHI:
91 000001				BLKW
				ERD

```

SYMBOL TABLE
DEN 000404R 000404R 000404R 000404R 000404R 000404R 000404R 000404R 000404R 000404R
IP 000372R 000372R 000372R 000372R 000372R 000372R 000372R 000372R 000372R 000372R
MAXX 000004R 000004R 000004R 000004R 000004R 000004R 000004R 000004R 000004R 000004R
FAXIS = ***** G 002 002 002 002 002 002 002 002 002 002
R1 =%000001 000001 000001 000001 000001 000001 000001 000001 000001 000001
SP =%000006 000006 000006 000006 000006 000006 000006 000006 000006 000006
YH 000024R 000024R 000024R 000024R 000024R 000024R 000024R 000024R 000024R 000024R
. ABS. 000000 000000 000000 000000 000000 000000 000000 000000 000000 000000
DETCOH 000036 000036 000036 000036 000036 000036 000036 000036 000036 000036
ERRORS DETECTED: 0 002 002 002 002 002 002 002 002 002
FREE CORE: 17061. WORDS 002 002 002 002 002 002 002 002 002 002
,DEI:FPLOT/R:TIME:LG=FPLOT

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

1	IERCDE	RT-11	MACRO	VM32-12	21-NOV-79	PAGE 1
2						
3						
4	000000					
5						
6						
7						
8	000000					
9	000000	017500	000002			
10	000012	016502	000004			
11	000016	062702	000006			
12	000022	005700				
13	000024	002001				
14	000036	005400				
15	000030	010001				
16	000032	005000				
17	000034	071027	000012			
18	000040	062701	000008			
19	000044	110142				
20	000046	005700				
21	000050	003357				
22	000052	005775	000002			
23	000056	002002				
24	000060	112742	000035			
25	000064	020265	000004			
26	000070	001403				
27	000072	112742	000049			
28	000076	000772				
29	000100					
30	000106	000207				
31		000001				

.TITLE IERCDE  
 .GLOBL IERCDE  
 .RECALL SAVE,URSAVE,.RECDEF  
 .RECDEF  
 .CALL IERCDECN,KNUP  
 N=10PUT BINARY NUMBER  
 KBUF=3WORD ASC11 OUTPUT DECIMAL  
 IERCDE:  
 SAVE 012  
 MOV 02(R5),R0  
 MOV 4(R5),R2  
 ADD #5,R2  
 TST R0  
 BCE IS  
 BEC R0  
 MOV R0,R1  
 CLR R0  
 DIV #10,R0  
 ADD #6,R1  
 MOV R1,-(R2)  
 TST R0  
 BCT IS  
 TST 02(R5)  
 BCE 25  
 MOV #55,-(R2)  
 CHR 12,4(R5)  
 BEQ 35  
 MOV #40,-(R2)  
 BR 25  
 URSAVE 210  
 RTS PC  
 .END

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

IERCDE RT-11 MACRO VM02-12 21-NOV-79 PAGE 1+  
SYMBOL TABLE

IERCDE 00000000 PC  
R3 =%0000003 R4

. ABE. 000000 000  
000110 001

ERRORS DETECTED: 0  
PAGE CORE: 1472. WORDS

,DECI: IERCDE/N: TTLE: LC= IERICEN

=%000007  
=%0000004

=%000000  
=%0000005

R1  
SP

=%0000001  
=%0000006

R2

=%0000002



```

53 000214 004767 00000000 PC,FLCT
59 000220 005057 00000000 IIRQ
60 000224 005267 0001240 RCIP
61 000230 000207 000140' PC
62 000232 005767 000140' TST
63 000236 001754 000140' BEQ
64 000240 005767 001224 TST
65 000244 001403 001216 BEQ
66 000246 005067 001216 CLR
67 000252 000207 000156 RTS
68 000254 026727 000000' 19: CHP
69 000256 003005 000036 BCT
70 000258 026727 000000' CMP
71 000262 002314 000000' BLT
72 000274 000207 000100' 11RNG: RTS
73 000276 026727 000100' 11RNG: CHP
74 000304 000207 000100' BCT
75 000306 005267 000100' INC
76 000312 005267 000014' INC
77 000316 005267 000002' INC
78 000322 000207 000100' 19: RTS
79 000324 005767 000100' 11RNG: TST
80 000330 003406 000100' BLE
81 000332 005367 000100' DEC
82 000336 005367 000014' DEC
83 000342 005267 000002' INC
84 000346 000207 000000' 19: RTS
85 000350 005067 000000' 11: CLR
86 000354 005767 000000' 19: TST
87 000360 001775 000000' BEQ
88 000362 016709 000000' MOV
89 000366 162700 000000' SUB
90 000372 020067 000032' CMP
91 000376 002764 000000' BLT
92 000400 020067 000022' CMP
93 000404 003361 000024' BCT
94 000406 016767 000000' MOV
95 000414 012705 000432' MOV
96 000420 004767 000000' JSR
97 000424 000207 000000' RTS
98 000426 000000' .WORD
99 000430 000000' .WORD
100 000432 SUPTXT
101 000432 CSRG,ICRSG,< INPUT CONTROL REQUESTED>
102 000436 CHXTXT < CHANNEL A+ IS DEFAULT INPUT>
103 000436 CHXTXT < CHANNEL B IS OFF>
104 000436 CHXTXT < CHANNEL A- IS OFF>
105 000436 CHXTXT <
106 000436 CHXTXT < SELECT CHANNEL A CONTROL>
107 000436 CHXTXT < 0 = MANUAL>
108 000436 CHXTXT < 1 = DIGITAL>
109 000436 SUPTXT ICRSG,ICRSG,< SELECT INPUT COUPLING>
110 000436 CHXTXT < 0 = GFF>
111 000436 CHXTXT < 1 = AC>
112 000436 CHXTXT < 2 = DC>
113 000436 SUPTXT ICRSG,ARMSG,< SELECT INPUT RANGES>
114 000436 CHXTXT < ALL RANGES ARE FROM -X TO +X>

```



SYMBOL TABLE

ACENT	000054R	002	ACRNG	000100R	002	APC	000070R	002	ARACT	000140R	003	AREG	001366R	003
ACTAT	000030R	003	BP	000026R	003	BPPOINT	000166R	003	CHOUT =	***** G	003	CHSC	000452R	003
CTHRES	000016R	003	DIRNG	000032R	003	DEP	000032R	003	ERASE =	***** G	003	FDY	000022R	003
FLAT =	***** G	004	FP	000024R	003	FPOINT	000022R	003	HI	000426R	003	HOLE =	***** G	003
ICF30F	000000R	003	ICRNG	000022R	003	IRNG	000022R	003	IN	000350R	003	IRCHD	000014R	003
IRNG	001102R	003	IRNG	000022R	003	IRNG	000022R	003	IRNG	000172R	003	IRNG	000232R	003
LABLH	000142R	003	LA	000030R	003	LPAIR	000034R	003	IRNG	000170R	003	RUN	000002	003
NOH =	000004	003	OP	000156R	003	OPCNT	000034R	003	IRNG	000170R	003	PC	000000R	003
PCHT	000036R	003	PCITE	000050R	003	PD	011632R	003	PDPWR	000146R	003	PEAK	000000R	003
PO	000032R	003	PDPWR	000032R	003	PDS	000032R	003	POSEND	000152R	003	PSCHT	000154R	003
P31	000020R	003	RCIP	001470R	003	R0	000000	003	R1	000000	003	R2	000000	003
R3	000003	003	R4	000004	003	R5	000005	003	SBFLG	000150R	003	SFBP	000156R	003
SP	000006	003	SPEAK	000004R	003	XDCRID	000006R	003	XFACT	000060R	003	XOFF	000064R	003
YFACT	000062R	003	YOFF	000066R	003									
. ABS.	000000	000												
ATPARA	000102	001												
RCCH	000072	002												
TECH	000002	003												
ERRNG DETECTED: 0		004												
FREE CORE: 16727. WORDS														

.DK1:IRNG/N:TTH/E:LC=IRNG

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

1	LSINTX	RT-11	MACRO	VHS2-12	21-NOV-79	PAGE 1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	32	33	34	35	36
37	38	39	40	41	42	43
44	45	46				

```

.TITLE LSINTX
.CLOBL RECXC,LSINT
.MCALL SAVE,UNSAVE,SUPTXT,CHTXT,CHSTOP,,REGDEF
.RECDEF
INC COMIP
SAVE 012
MOV #167740,R2 ;R2 POINTS TO CSR
BIC #40,(R2) ;DISABLE INTERRUPT
MOV #4,,R0 ;GET 4. WORDS
MOV #LSIDAT,R1 ;ADDRESS OF BUFFER
TST (R2) ;WAIT FOR INTERRUPT
IS 15
BCE @#167744,(R1)+ ;CET CORD
MOV #1,(R2) ;ACKNOWLEDGE
BIS (R2) ;WAIT FOR #45 TO CLEAR
TST 25
BLT #1,(R2) ;CLEAR INTERRUPT
BIC R0,R1 ;REPEAT
SOB #40,(R2) ;ENABLE INTERRUPT
BIS LSIDAT,R0 ;CET STATUS
MOV LSIDAT+1,R1 ;CET COMMAND
INC R0 ;SET UP TO CET FLAG WORD
ASH #3,R0
ADD R0,R1
MOV FLGMRDR1,R0 ;CET FLAG NUMBER
INC @FLGS(R0)
TST R0
BNE LSOUT ;ENCODERS NOT RECEIVED - RETURN
MOV LSIDAT+2,RCDR
MOV LSIDAT+4,RCDR+2
MOV LSIDAT+6,RCDR+4
LSOUT:
CHP R0,#3.
BNE 15
JSR PC,RECXC
CHP R0,#14
BNE 23
CLR CCHTR
UNSAVE 210
DEC COMIP
RTI
FLCVRD: .BYTE 6,6,6,6,6,6,6,6
.BYTE 12,2,4,0,4,12,12,0
.BYTE 12,12,0,12,0,12,12,12
.BYTE 12,12,10,12,10,12,12,12
.BYTE 12,12,14,12,14,12,12,12
.WORD RCDRCV,ARIVED,SCNF1H,ERROR,TFCNT,NUL,SPCNT

```

```

000266 000170'
47 000270 000000
48 000000 000000
49 000000 000000
50 000002 000000
51 000004 000000
52 000006 000000
53 000010 000000
54 000012 000000
55 000014 000000
56 000016 000000
57 000020 000000
58 000022 000000
59 000024 000000
60 000026 000000
61 000030 000000
62 000032 000000
63 000034 000000
64 000036 000000
65 000040 000000
66 000042 000000
67 000044 000000
68 000046 000000
69 000050 000000
70 000056 000000
71 000070 000000
72 000072 000000
73 000074 000000
74 000076 000000
75 000100 000000
76 000122 000000
77 000124 000000
78 000126 000000
79 000130 000134
80 000132 000012
81 000134 000000
82 000162 000000
83 000164 000000
84 000166 000000
85 000170 000000
86 000000 000000
87 000000 000000
88 000000 000000
89 000000 000000
90 000002 000000
91 000004 000000
92 000006 000000
93 000014 000000
94 000016 000000
95 000020 000000
96 000022 000000
97 000024 000000
98 000026 000000
99 000030 000000
100 000032 000000
101 000034 000000

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SEARCH  
IRXC2

IRXC  
IRXC

```

; COMMAND TO LSI-11
; COMMAND DATA
; SCAN FINISHED FLAG
; SCAN AXIS
; NUMBER OF POINTS ON SCAN AXIS
; HUBHUB INCREMENT IN X/Y PLANE
; DATA FROM LSI-11
; ERROR FLAG
; COMMUNICATIONS IN PROGRESS
; SCAN PASS COUNT
; PEAK OF CURRENT PULSE
; INPUT RANGE CHANGE REQUEST FLAG
; PEAK OF OVERALL SCAN (SO FAR)
; TRANSDUCER IDENTIFICATION
; INPUT RANGE COMMAND FOR BIOGATION
; CURRENT COUNTER LINT THRESHOLD
; CURRENT POINT STATUS (FOR ORDER)
; CURRENT Y VALUE
; CURRENT 'FRONT' POINT
; CURRENT 'BACK' POINT
; ARRAY STATUS: 0=ALL POINTS IN ARRAY ON THRESHOLD HAVE BEEN FOUND BY
; 1= SOME POINTS REMAIN, 2=BERGINING NEW ARRAY OR NEW THRESHOLD
; POINTER TO PO AND POS
; ADDRESS OF LAST POINT PROCESSED BY ORDER

```



## SYMBOL TABLE

ARACT	000149R	004	ARRIVED	000164R	002	ASTAT	000030R	004	AXIS	000126R	002	BP	000026R	004
BPPOINT	000166R	004	CCNTR	000070R	004	CHDAT	000100R	002	COHAND	000076R	002	CONIP	000166R	002
CTHRES	000168R	004	DCHIN	000132R	002	ERROR	000162R	002	FBY	000022R	004	FLCS	000252R	004
FLCHRD	000202R	004	FP	000224R	004	FPOINT	000322R	004	IRCHD	000014R	004	IRHQ	000002R	004
LECHIN	000142R	004	LPADR	000034R	004	LSIDAT	000134R	002	LSINT	000000R	002	LSOUT	000142R	002
NCBR	000050R	002	NCRCV	000122R	002	NUL	000270R	004	HUM	000002	004	HUPRT	000136R	004
NHCH	000004	004	OP	000136R	004	OPCNT	000146R	004	PC	000007	004	PCNT	000036R	004
PCITE	000060R	004	PD	011632R	004	PPNTR	000146R	004	PEAK	000000R	004	PQ	000032R	004
POPTR	000072R	004	PDS	000032R	004	POSEND	000152R	004	PCNT	000154R	004	PS1	000020R	004
RELOC	000000	000	R0	000000	004	R1	000001	004	R2	000002	002	R3	000003	004
R1	000004	002	R5	000005	002	SBFLC	000150R	004	SCHFIN	000124R	002	SFBP	000156R	004
SOURCE	000000R	002	SP	000006	002	SPCNT	000170R	002	SPEAK	000044R	004	SRCHTP	000032R	002
STATUS	000034R	002	SX1	000020R	002	SX2	000025R	002	SV1	000022R	002	SV2	000030R	002
SZ1	000024R	002	SZ2	000032R	002	TFCNT	000000R	004	TX1	000004R	002	TY2	000012R	002
TY1	000006R	002	TY2	000144R	002	TZ1	000010R	002	TZ2	000016R	002	XOCRID	000006R	004
XDIR	000036R	002	XPACT	000060R	004	XLIM1	000066R	002	XLIN2	000072R	002	XOFF	000064R	004
YDTR	000042R	002	YDIR	000040R	002	YFACT	000062R	004	YLIN1	000070R	002	YLIN2	000074R	002
YOFF	000066R	004	YDTR	000040R	002	ZPNT	000046R	002						
. ARES.	000000	000												
SRCOM	000272	001												
DIRCON	000172	002												
DIRCON	000002	003												
XERR1	000022	004												

ERRORS DETECTED: 0

FREE CORE: 16673. WORDS

, DET: LSINTX/R: TTM/E: LC=LSINTX

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



53	000230	000304	ASL	R4	;GET POINT
54	000232	016404	MOV	PO(R4), R4	;GET X COORDINATE
55	000234	110405	MOV	R4, R5	
56	000236	110405	MOV	R2, -(SP)	
57	000238	177400	BIC	#177400, (SP)	
58	000240	042716	SUB	(SP)+, R5	
59	000242	162503	DCE	OR2, 3	
60	000244	020091	HEC	R5	
61	000246	005405	CHP	R5, #1	
62	000248	020527	BCT	OR2, 1	
63	000250	003331	MOV	R4, R5	
64	000252	010405	CLRB	R5	
65	000254	103605	SWAB	R5	
66	000256	060305	MOV	R2, -(SP)	
67	000258	103615	CLRB	(SP)	
68	000260	060315	SWAB	(SP)	
69	000262	162505	SUB	(SP)+, R5	
70	000264	002901	DCE	OR2, 4	
71	000266	003405	HEC	R5	
72	000268	003405	CHP	R5, #1	
73	000270	020527	BCT	OR2, 1	
74	000272	003315	MOV	R4, R2	
75	000274	010402	MOV	-(R0), R3	
76	000276	114903	ADD	#4, R3	
77	000278	062704	MOV	R3, (R0)+	
78	000280	110320	JSR	PG, PLTVL	
79	000282	003767	INC	OPCCT	
80	000284	003267	MOV	LPADR, R5	
81	000286	016705	ADD	(R5), R4	
82	000288	111504	ADD	#4, R4	
83	000290	000004	MOV	R4, (R5)	
84	000292	177770	BIT	#177770, R3	
85	000294	001650	BEO	OR2	
86	000296	004767	JSR	PG, CCLT	
87	000298	000656	BR	ORDER	
88	000300	003767	TST	PSCT	
89	000302	001420	BEO	IS	
90	000304	111034	MOV	(R0), R4	
91	000306	062704	ADD	#4, R4	
92	000308	110410	MOV	R4, (R0)	
93	000310	016705	MOV	FPA, R4	
94	000312	116405	MOV	POS(R4), R5	
95	000314	032705	BIT	#177770, R5	
96	000316	001357	BRE	OR4, 5	
97	000318	003705	ADD	#4, R5	
98	000320	110554	MOV	R5, POS(R4)	
99	000322	000732	BR	OR4, 5	
100	000324	003267	INC	PSCT	
101	000326	005300	INC	R9	
102	000328	000641	BR	OR2, 1	
103	000330	000000	WORD	0	
104	000332	000000	.CSECT	RCON	
105	000334	000000	WORD	0	
106	000336	000000	WORD	0	
107	000338	000000	WORD	0	
108	000340	000000	WORD	0	
109	000342	000000	WORD	0	
110	000344	000000	WORD	0	
111	000346	000000	WORD	0	
112	000348	000000	WORD	0	
113	000350	000000	WORD	0	
114	000352	000000	WORD	0	
115	000354	000000	WORD	0	
116	000356	000000	WORD	0	
117	000358	000000	WORD	0	
118	000360	000000	WORD	0	
119	000362	000000	WORD	0	
120	000364	000000	WORD	0	
121	000366	000000	WORD	0	
122	000368	000000	WORD	0	
123	000370	000000	WORD	0	
124	000372	000000	WORD	0	
125	000374	000000	WORD	0	
126	000376	000000	WORD	0	
127	000378	000000	WORD	0	
128	000380	000000	WORD	0	
12					

```

123 000006      XDCRID: .BLEB      6.
129 000014      ICHID: .WORD 0
130 000016      CTURES: .WORD 0
131 000020      PSI: .WORD 0
132 000022      FBY: .WORD 0
133 000024      FP: .WORD 0
134 000026      BP: .WORD 0
135 000030      ASTAT: .WORD 0
136 000032      :
137 000034      LPAHR: .WORD 0
139 000036      PCNT: SUPTXT PCNT,PCNTE,< % >
141 000050      NFACT: .WORD 7
142 000052      YFACT: .WORD 7
143 000054      YOFF: .WORD 162.
144 000056      YOFF: .WORD 30.
145 000060      ARACT: .WORD 0
146 000140      LBLHIN: .WORD 0
147 000142      PCNTH: .WORD 0
148 000146      PDPHTR: .WORD 0
150 000150      SEFLC: .WORD 0
151 000152      PASEHD: .WORD 0
152 000154      PSCHT: .WORD 0
153 000156      OP:
154 000156      SFBP: .BLEB 100.
155 000322      FPOINT: .BLEB 100.
157 000456      EPOINT: .BLEB 100.
158 000632      PO: .BLEB 1536.
159 000632      PGS: .BLEB 1536.
160 001632      PB: .BLEB 10000.
161      GGGGGG1'

;TRANSDUCER IDENTIFICATION
;INPUT RANGE COMMAND FOR BIOHATION
;CURRENT COUTOUR LINT THRESHOLD
;CURRENT POINT STATUS (FOR ORDER)
;CURRENT Y VALUE
;CURRENT 'FRONT' POINT
;CURRENT 'BACK' POINT
;ARRAY STATES: 0=ALL POINTS IN ARRAY ON THRESHOLD HAVE BEEN FOUND BY
I= SOME POINTS REMAIN, 2=BEGINNING NEW ARRAY OR NEW THRESHOLD
; POINTER TO PO AND POS
; ADDRESS OF LAST POINT PROCESSED BY ORDER

;SCALE FACTOR FOR X AXIS OF DISPLAY
;SCALE FACTOR FOR Y AXIS OF DISPLAY
; X AXIS OFFSET FOR DISPLAY
; Y AXIS OFFSET FOR DISPLAY

;AUTO RANGING ACTIVE FLAG
2 ;HINHIN POINT COUNT FOR LINE TO BE LABELED
;ORDERED POINT COUNT
;POINTER TO PEAK DATA ARAY
;FLAG TO/FRON SBTUP
;END OF PGS ARRAY
;PANS COUNT
;ORDERED POINTS OUT OF ORDER PROCESSING
OP OVERLAYS SFBP,FRONT,AND REPOINT
;STATES OF F/B POINTS EXTRACTED BY SPB
;FRONT POINTS EXTRACTED BY SPB
;BACK POINTS EXTRACTED BY SPB
;POINTS OUT OF FRONT/BACK OF C/PLOT
;STATES OF PO POINTS
;ARRAY OF PEAK DATA (100.X100.)

```

SYMBOL TABLE

ARACT	000140R	002	ASTAT	000030R	002	BP	000025R	002	BPQ/INT	000466R	002	CEPLT = ***** C	002
CTURES	000016R	002	FBY	000022R	002	FP	000025R	002	FPA	000442R	002	FPQ/INT	000322R
INCHD	000044R	002	IRHQ	000032R	002	LBLMIN	000140R	002	LPADR	000034R	002	RQH =	000002
RUH1 =	000004		GP	000155R	002	GPCT	000144R	002	GRDER	000000R	002	OR2	000116R
OR2.1	000144R		OR2.2	000156R		OR2.3	000254R		OR2.4	000304R	002	OR3	000364R
OR4	000324R		OR4.5	000356R		PC	000000R		PCRT	000036R	002	PCSTE	000060R
PD	011632R	002	POPTRA	000145R	002	PEAK	000000R	002	PLTCL = ***** C	P9	000632R	002	
POPNTN	000032R	002	POS	000632R	002	POSEND	000152R	002	PSCNT	000154R	002	PS1	000020R
R0	=000000		R1	=000001		R2	=000002		IS3	=000003		R4	=000004
R5	=000005		SBFLC	000150R	002	SFBP	000156R	002	SP	=000006	002	SPEAK	000004R
XDCRID	000006R	002	XFACT	000060R	002	XOFF	000054R	002	YFACT	000062R	002	YOFF	000066R

. ABS. 000000 000  
 MCHH 000000 001  
 MCHH 000002 002  
 ERRORS DETECTED: 0  
 FREE CORE: 16017. WORDS

.DK1:ORDER/R:TTHE/LC=ORDER

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR

```

1  .TITLE PAXIS
2  .GLOBL PAXIS,PCSCALE,ERASE,IPLLOT,CHOUT
3  .MCALL SAVE,UNSAVE,.RECDEF
4  .RECDEF
5  CALL PAXIS
6  INPUT: HIRX,MAXX,HIRY,MAXY FROM DSPCOM
7  USES   XO,YO,XLO,XHI,YLO,YHI,DX,DY
8         XLNG,XTLBL,YLNG,YTBL IN DSPCOM
9  PLOTS FIXED AXIS WITH LABELED TIC MARKS
10 SAVE 012345
11 NOV #SCALL,R5
12 NOV #SCALL+2,R1
13 NOV #HIRX,(R1)+
14 NOV #MAXX,(R1)+
15 NOV #XLO,(R1)+
16 NOV #XHI,(R1)+
17 NOV #DX,(R1)+
18 NOV #XTLBL,(R1)+
19 NOV #XLNG,(R1)+
20 NOV #XO,(R1)+
21 NOV #ALX,(R1)+
22 NOV #HDEX,(R1)
23 JSR PC,PCSCALE
24 NOV #SCALL,R5
25 NOV #SCALL+2,R1
26 NOV #HIRY,(R1)+
27 NOV #MAXY,(R1)+
28 NOV #YLO,(R1)+
29 NOV #YHI,(R1)+
30 NOV #DY,(R1)+
31 NOV #YTLBL,(R1)+
32 NOV #YLNG,(R1)+
33 NOV #YO,(R1)+
34 NOV #ALY,(R1)+
35 NOV #HDEY,(R1)
36 JSR PC,PCSCALE
37 CLR IP
38 NOV #100.,IX
39 NOV #620.,IY
40 NOV #PCALL,R5
41 JSR PC,IPLLOT
42 NOV #70.,IY
43 INC IP
44 JSR PC,IPLLOT
45 NOV #1000.,IX
46 JSR PC,IPLLOT
47 NOV #44.,TX
48 NOV #20.,TY
49 NOV #XLNG,R3
50 CLR R4
51 NOV #XTLBL,R2
52 CLR IP
53 NOV #52.,R0
54 NOV #50.,R1
55 NOV R0,IX
56 NOV R1,IY
57 NOV #PCALL,R5

```

;SET X SCALE IF NEEDED

;SET Y SCALE IF NEEDED

;DRAW AXIS LINES

;SET UP TO PLOT X TIC LABELS

;X VALUE START  
;Y VALUE START

```

53 000322 004767 000000C JSR PC, IPLOT
59 000326 012357 000262 MOV (R2)+, CBUF
60 000332 012367 000269 MOV (R2)+, CBUF+2
61 000336 012367 000256 MOV (R2)+, CBUF+4
62 000342 012705 000606 MOV #CHCALL, R5
63 000346 004767 000000C JSR PC, CHOUT
64 000352 006767 000244 TX, IX
65 000360 006767 000174 ADD TX, IV
66 000366 012705 000559 MOV #PCALL, R5
67 000372 004767 000000C JSR PC, IPLOT
68 000376 012705 000556 MOV #XCALL, R5
69 000402 003704 TST R4
70 000404 001402 BE2 NX
71 000406 012705 MOV #DCALL, R5
72 000412 004767 JSR PC, CHOUT
73 000416 000300 ADD R3, R0
74 000420 000401 ADD R4, R1
75 000422 020027 CMP R0, #1000
76 000426 000003 BGT NXT
77 000430 020127 CMP R1, #620
78 000434 003724 BLE NL
79 000436 003703 TST R3
80 000440 001421 BE2 OUT
81 000442 012767 MOV #75, TX
82 000450 012767 MOV #7, TY
83 000456 000003 CLR R3
84 000460 016704 YLNC, R4
85 000464 012762 MOV #YTLBL, R2
86 000470 012700 MOV #25, R9
87 000474 012701 MOV #70, R1
88 000500 000167 JEP NL
89 000504 OUT: URSAVE 543210
90 000520 000207 RTS PC
91 000522 000012 SCALL: 10, 0, 0, 0, 0, 0, 0, 0, 0, 0
92 000530 000000 PCALL: 3, IX, IV, IP
93 000536 000000 IX: 0
94 000540 000000 IY: 0
95 000544 000000 IP: 0
96 000548 000001 XCALL: 1, XCALL+4, 1
97 000552 000001 DCALL: 1, DCALL+4, 1
98 000556 000001 CHCALL: 1, CHCALL+4, 6
99 000560 000000 CBUF: 0, 0, 0
100 000564 000000 TX: 0
101 000568 000000 TY: 0
102 000572 000000 ALX: 0
103 000576 000000 ALY: 0
104 000580 000000 PTYPE: 0
105 000584 000000 RINX: 0
106 000588 000000 MAXX: 0
107 000592 000000 MINY: 0
108 000596 000000
109 000600 000000
110 000604 000000
111 000608 000000

```

;CHECK BOTH AXIS PLOTTED

;SET UP TO PLOT TIC LABELS

;STARTING X

;STARTING Y

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SYMBOL TABLE

ALX	00000007	ALY	00000000	CBUF	000614R	CHCALL	000606R	CHOUT	***** G	
BCALL	00000000	BTYP	00000000	DK	00000000	DY	00000000	EMGE	***** G	002
IF	00000000	IFLOT	***** G	IX	00000000	IX	000562R	MAXX	00000000	002
MAXY	00000000	MINI	00000000	MINY	00000000	MINY	000562R	MAXX	00000000	002
NL	00000000	NK	00000000	NNT	00000000	NT	000562R	MAXX	00000000	002
PC	00000000	PCALL	00000000	PSCALE	***** G	PCALL	000562R	MAXX	00000000	002
R2	00000000	R3	00000000	R4	00000000	R5	000562R	MAXX	00000000	002
SP	00000000	TX	00000000	TY	00000000	TY	000562R	MAXX	00000000	002
XLNC	00000000	XL0	00000000	XTL	00000000	XTL	000562R	MAXX	00000000	002
YLNC	00000000	YLO	00000000	YTL	00000000	YTL	000562R	MAXX	00000000	002
ABS.	00000000		00000000		00000000		000562R	MAXX	00000000	002
DEPCOH	00000000		00000000		00000000		000562R	MAXX	00000000	002
ENHORS DETAIL	0		00000000		00000000		000562R	MAXX	00000000	002
FREE CORE	10005. WORDS		00000000		00000000		000562R	MAXX	00000000	002

.BK1:PAYIS/R:TTL/E:LG=PAYIS

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

1  .TITLE PLTCL : PLOT CONTOUR LINE
2  .GLOBL CPT, I, PLT, ALPHA, COUT, PLTCL
3  .MCALL CHTXT, CHTUP, SAVE, UNSAVE, SUPTXT, .RECDEF
4  .RECDEF
5  TST OPCNT
6  BGT I3
7  NGV R2, LNPP
8  CLR I3
9  RTS PC
10 SAVE 012345
11 FOV R2, HP
12 CHT CHT, #1
13 BHE PL5
14 CLR I3
15 BR PL7.1
16 NGVB LNPP, R1
17 NGVB LPP, R2
18 SUB R1, R1
19 NGV R1, -(SP)
20 NGVB NP+1, R3
21 NGVB LPP+1, R4
22 SUB R4, R3
23 NGV R3, -(SP)
24 NGVB R1, R3
25 NGVB NP, R1
26 SUB R2, R1
27 NGV R1, -(SP)
28 NGVB LNPP+1, R2
29 SUB R4, R2
30 MUL R2, R1
31 CHT R3, R1
32 BHE PL6.9
33 UNSAVE 013
34 TST R3
35 BGE I3
36 NEG R3
37 HEG R9
38 CHT R3, R3
39 BGT PL7
40 TST R2
41 BGE R2
42 HEG R2
43 NEG R1
44 CHT R2, R1
45 BLE PL7.5
46 BR PL7
47 PL6.9: ADD #6, SP
48 PL7.1: NGV #1, I3
49 JSR PC, CHT
50 NGV LNPP, LPP
51 NGV NP, LNPP
52 UNSAVE 543219
53 RTS PC
54 CHTLT: SAVE 5
55 JSR PC, CHT
56 CHT CHT, LBLMIN
57 BLT COUT

```

: GET OLDX  
 : GET LAST PLOTTED X  
 : GET DELTA X1  
 : SAVE DELTA X1  
 : GET NEW Y  
 : GET LAST PLOTTED Y  
 : GET DELTA Y2  
 : SAVE DELTA Y2  
 : (DELTA X1) (DELTA Y2)  
 : GET NEW X  
 : GET DELTA X2  
 : GET OLD Y  
 : GET DELTA Y1  
 : (DELTA X2) (DELTA Y1)  
 : CHECK FOR LINEARITY  
 : NONLINEAR  
 : NONLINEAR  
 : LINEAR: REPLACE OLD POINT WITH NEW POINT  
 : PEN DOWN TO PLOT LAST HPP  
 : CONVERT AND PLOT  
 : LAST NON-PLOTTED --> LAST PLOTTED  
 : NEW --> LAST NON-PLOTTED  
 : PLOT LAST NON-PLOTTED POINT



PLTCL ;PLOT CONTOUR LINE

RT-11 MACRO VN02-12

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```
115 000156
116 000322
117 000456
118 000632
119 000808
120 011632
121 000001'

;
CFBP: .BLKB 100.
FPOINT: .BLKB 100.
BPOINT: .BLKB 100.
PO: .BLKB 1536.
PG3: .BLKB 1536.
PD: .BLKB 10000.
      .END

OP OVERLAYS SFBP,FRONT,AND BPOINT
;STATUS OF F/B POINTS EXTRACTED BY SPD
;FRONT POINTS EXTRACTED BY SPD
;BACK POINTS EXTRACTED BY SPD
;POINTS OUT OF FRONT/BACK OF CPLOT
;STATUS OF PO POINTS
;ARRAY OF PEAK DATA (100.X100.)
```

ALPHA = ***** G	002	0000000R	002	BP	0000000R	002	BPPOINT	0000000R	002
CCOUT	0000000R	0000000R	002	CHP	0000000R	002	CTIBES	0000000R	002
FDY	0000000R	0000000R	002	IP	0000000R	002	IPLOT = ***** G	0000000R	002
IRHD	0000000R	0000000R	002	LY	0000000R	002	LBLIN	0000000R	002
LEPT	0000000R	0000000R	002	NP	0000000R	002	NUH = 000000	0000000R	002
NUH = 000000	0000000R	0000000R	002	OP	0000000R	002	PC = 000000	0000000R	002
PCALL	0000000R	0000000R	002	PD	0000000R	002	POPTR	0000000R	002
PEAK	0000000R	0000000R	002	PL0.9	0000000R	002	PL7	0000000R	002
PL7.1	0000000R	0000000R	002	P0	0000000R	002	POPTR	0000000R	002
POS	0000000R	0000000R	002	PS1	0000000R	002	R0 = 000000	0000000R	002
RJ = 000000	0000000R	0000000R	002	R4	0000000R	002	R5 = 000000	0000000R	002
SRPLC	0000000R	0000000R	002	SPEAK	0000000R	002	XDCRID	0000000R	002
SRFACT	0000000R	0000000R	002	YOFF	0000000R	002			
. ABS.	0000000R	0000000R	000						
YCOOH	0000000R	0000000R	001						
YCOOH	0000000R	0000000R	002						

ERRORS DETECTED: 0  
FILE CORE: 15799. WORDS

, DE1: PLTCL/H: TTLE/LC=PLTCL

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

1  .TITLE PLTW
2  .GLOBL PLTW,IPLOT,CHOUT,HOME
3  .MCALL SUPTXT,CHTXT,CHSTUP,SAVE,UNSAVE,.REGDEF
4  .REGDEF
5  TST WTP
6  BNE P0
7  RTS PC
8  SAVE 01235
9  MOV #WDAT1,R5
10 CLR R3
11 MOV XWL,R0
12 SUB STARTX,R0
13 MOV MAXX,R2
14 SUB MINX,R2
15 NUL R2,R0
16 MOV STOPX,R2
17 SUB STARTX,R2
18 DIV R2,R0
19 ADD MINX,R0
20 NUL #900,,R0
21 MOV XH1,R2
22 SUB XLO,R2
23 DIV R2,R0
24 ADD #100,,R0
25 MOV X9,R0
26 BNE P2
27 INC R3
28 BR R3
29 CLR R3
30 MOV YWL,R0
31 MOV #550,,R0
32 MOV YH1,R2
33 SUB YLO,R2
34 DIV R2,R0
35 ADD #70,,R0
36 MOV Y9,R0
37 MOV R9,-(R5)
38 TST R3
39 INC R3
40 MOV YMH,R0
41 BR P25
42 CHIP STARTX,XWL
43 BLE 13
44 MOV STARTX,XWL
45 CHIP STOPX,XWL
46 BGE 23
47 MOV STOPX,XWL
48 CHIP YLO,YWL
49 BLE 33
50 MOV YLO,YWL
51 CHIP YH1,YMH
52 BGE P4
53 MOV YH1,YMH
54
55
56
57

```

;CHECK WINDOW TYPE  
 ;IF TYPE ZERO (INACTIVE), RETURN  
  
 ;SET UP DATA STACK  
 ;SECOND PASS FLAG  
 ;GET X LOW  
 ;CONVERT X TO SCREEN COORDINATES  
  
 ;CHECK FOR SECOND PASS  
  
 ;SET SECOND PASS  
 ;GET HIGH X  
 ;CO CONVERT X HI  
 ;SECOND PASS FLAG  
 ;GET Y LOW  
 ;CONVERT Y TO SCREEN COORDINATES  
  
 ;CHECK FOR WINDOW OUTSIDE DISPLAY



```

113 000400 000000
114 000402 000000
115 000404 000000
116 000406 000000
117 000410 000000
118 000412 000000
119 000414 000000
120 000001

;COORDINATES OF WINDOW TO BE PLOTTED IN DATA UNITS
;WINDOW TYPE FOR PLTV
;CHARACTER INTERED WITH FIRST WINDOW POINT
;END

```

CHOUT = ***** C	DTYPE	000000R	003	HOME	= ***** G	IPCALL	000434R	003	IP	000460R	003
IPLOT = ***** C	IX	000134R	003	IY	000335R	HARK	000004R	003	MAXY	000010R	003
NIIR	000002R	003	PC	P1	0000007	PCALL	000444R	003	PLTW	000000R	003
PHY	000322R	003	P5	P5	000034R	P2	000134R	003	P23	000142R	003
P3	000275R	003	R1	R1	000375R	P3	000420R	003	RETR	000000R	003
RETR2	000006R	003	SP	SP	0000001	R2	0000002	003	R3	0000003	003
R3	0000004	003	TURDT	TURDT	0000005	SSACT	000010R	003	STARTX	000002R	003
STPR	000004R	003	WTP	WTP	0000006	VCHAR	000414R	003	STAT	000420R	003
WDAT1	000500R	003	XMI	XMI	000412R	WTPC	000462R	003	XH1	000020R	003
XLO	000016R	003	YLO	YLO	000466R	XMI	000402R	003	X0	000012R	003
YHCTH	000400R	003			000022R	YMI	000410R	003	YWL	000404R	003
Y0	000014R	003									

ABS. 000300 000  
 NTHCON 000012 001  
 BEH CON 000016 003  
 ERRORS DETECTED: 0  
 FREE CORE: 16010. V0003

.DET: PLTWG/H: TTH/E: LQ=PLTWG

REPRODUCIBILITY OF THE  
 ORIGINAL PAGE IS POOR

```

PRE      ;PULSE AND ENCODE      RT-11 MACRO VH02-12  21-NOV-79 PAGE 1

1
2
3
4 000000
5 000000 005767 000002*
6 000004 001416
7 000006 004767 000000G
8 000012 005767 000124*
9 000016 001013
10 000020 012767 000010 000076*
11 000026 005067 000122*
12 000032 012700 000001
13 000036 004767 000000G
14 000042 004767 000000G
15 000046 000297
16 000050
17
18 000002 000000
19
20 000076 000000
21
22 000122 000000
23 000124 000000
24 000001*

;TITLE PNE ;PULSE AND ENCODE
;CLOBL ARI,PNE,WRTLSI,CONDSP
;RECALL .RECODEF
;RECODEF
TST SRCHTP
BEQ IS
JSR PC,ARI
TST SCHFIN
BNE OUT
MOV #3,COHAND
CLR HCDRCV
MOV #1,R0 ;ONE WORD COHAND
JSR PC,WRTLSI
RTS PC,CONDSP
IS:
OUT:
;FIRE WHEN READY
;SEND COHAND TO LSI

;IF "NO SCAN", PULSE ALREADY SENT

```

# PNE : PULSE AND ENCODE SYMBOL TABLE

RT-11 MACRO V102-12 21-NOV-79 PAGE 1+

AIN = \*\*\*\*\* C

PC = 5000007

R3 = 5000003

SHIFT 0000000

. AES. 0000000

SCNCOH 000126

ERRORS DETECTED: 0

FREE CORE: 17242, WORDS

. DEL: PRE/R: TTH/E: LC=PRE

CONARD 600076R

PNE 0000000RC

R4 = 50000004

WRTLS1 = \*\*\*\*\* G

002 CONDSP= \*\*\*\*\* C

R0 = 50000000

R5 = 50000003

NCDCRV 000122R

R1 = 50000001

SCNF1N 000124R

002 OUT

R2

002 SP

000046R

50000002

50000006



```

56 000006 XDCRID: .BLKB 6.
57 000014 IRCMD: .WORD 0
58 000016 CTHRES: .WORD 0
59 000020 PSI: .WORD 0
60 000022 FBV: .WORD 0
61 000024 FP: .WORD 0
62 000026 BP: .WORD 0
63 000030 ASTAT: .WORD 0
64 000032 POPNTR: .WORD 0
65 000034 LPADR: .WORD 0
66 000036 PCNTE: SUPTXT PCNT,PCNTE,< % >
67 000038 PCNTE:
68 000040 XFACT: .WORD 7
69 000042 YFACT: .WORD 7
70 000044 XOFF: .WORD 162.
71 000046 YOFF: .WORD 30.
72 000048 CCNTR: .WORD 0
73 000050 ARACT: .BLKW 19.
74 000052 LBLMIN: .WORD 0
75 000054 OPCNTR: .WORD 0
76 000056 PDPNTR: .WORD 0
77 000058 SBFLG: .WORD 0
78 000060 POSEND: .WORD 0
79 000062 PSCNT: .WORD 0
80 000064 OP:
81 000066 SFBP: .BLKB 100.
82 000068 FPOINT: .BLKB 100.
83 000070 BPOINT: .BLKB 100.
84 000072 PO: .BLKW 1536.
85 000074 POS: .BLKB 1536.
86 000076 PD: .BLKW 10000.
87 000078 CSECT: SCRCOH
88 000080 SRCHTP: .BLKW 1
89 000082 STATUS: .WORD 0
90 000084 NCDR: .BLKW 12.
91 000086 SCNF IN: .BLKW 5
92 000088 SPCNT: .BLKW 7
93 000090 .BLKW 17
94 000092 .WORD 0
95 000094 .BLKW 17.
96 000096 .WORD 0
97 000098 .BLKW 17.
98 000100 .WORD 0
99 000102 .BLKW 17.
100 000104 .WORD 0
101 000106 .END

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

ACHNG	000100R	002	ARACT	000140R	003	ASTAT	000030R	003	BP	000026R	003	BPPOINT	000466R	003
CHCTR	000070R	003	CTHRES	000016R	003	FDY	000032R	003	FP	000024R	003	FTPOINT	000322R	003
FULL	000162R	003	INCHD	000014R	003	INQ	000032R	003	LMLMIN	000142R	003	LPAOR	000334R	003
RCBR	000050R	004	HUN	= 000032		HUNH	= 000034		OP	000156R	003	OPCNT	000144R	003
OUT	000154R	003	OUT1	000140R	003	PC	0000397		PCNT	000036R	003	PCNTE	000030R	003
PD	011632R	003	PDNTR	000146R	003	PEAK	000030R		P0	000032R	003	P0PNT	000032R	003
PK3	000632R	003	PK3RID	000100R	003	PSCNT	000154R		PS1	000030R	003	RECKG	000030R	003
PK2	000102R		PKTHL	000170R		R9	= 000030		R1	= 000001		R2	= 000032	
R3	= 000030		R4	= 000034		R5	= 000035		SHFLG	000150R	003	SCNFIN	000124R	004
STUP	000156R	003	SP	= 000006		SPCNT	000170R		SPEAK	000004R	003	SCNTP	000002R	004
STATUS	000034R	004	XDCRID	000006R	003	XFACT	000006R		XOFF	000064R	003	YFACT	000062R	003
YOFF	000066R	003												
. AHS.	000000	000												
ATPARA	000206	001												
XKXOH	000102	002												
SKXOH	000572	003												
SKXOH	000172	004												

ERRORS DETECTED: 0  
FREE CORE: 16879. WORDS

.DK1:RECHG/N:TTM/E:LC=RECHG

```

1  .TITLE RTL ;REAL-TIME LOOP
2  .CLOBL RTL,PNE,IRXC1,IRXC2,B31C0X,CONDSP,SEARXC,REXC
3  .MCALL .REGDEF
4  000000
5
6
7
8
9  000000 005067 000002'
10 000004 004767 000000C
11 000010 004767 000000C
12 000014 005767 000002'
13 000020 001403
14 000022 005767 000124'
15 000026 001026
16 000030 004767 000122'
17 000034 001765
18 000036 004767
19 000042 004767 000000C
20 000046 004767 000000C
21 000052 004767 000000C
22 000056 004767 000000C
23 000062 004767 000000C
24 000066 004767 000000C
25 000072 004767 000000C
26 000076 003767 000124'
27 000102 001742
28 000104 003067 000024'
29 000110 003067 000002'
30 000114 000207
31 000000'
32
33 000002 000000
34
35 000024 000000
36
37 000122 000000
38 000124 000000
39 000000'
40
41 000002 000000
42 000001'

```

;  
 ;  
 ;  
 ; RTL: CLR  
 ; RLI: JSR  
 ; 23: JSR  
 ; TST  
 ; BNE  
 ; TST  
 ; BEQ  
 ; JSR  
 ; JSR  
 ; JSR  
 ; JSR  
 ; JSR  
 ; TST  
 ; BEQ  
 ; CLR  
 ; RTS  
 ; CSECT  
 ; BLKW  
 ; WORD  
 ; STATUS  
 ; RCHRCV  
 ; SCHFIN  
 ; IRRQ  
 ; END

; TITLE RTL ;REAL-TIME LOOP  
 ; CLOBL RTL,PNE,IRXC1,IRXC2,B31C0X,CONDSP,SEARXC,REXC  
 ; MCALL .REGDEF  
 ; REGDEF  
 ;  
 ; IN WHICH TIMING IS CRITICAL.  
 ;  
 ; IRRQ  
 ; PC,PNE  
 ; PC,CONDSP  
 ; SRCHTP  
 ; 23  
 ; SCRFIN  
 ; IS  
 ; NCDRCV ; WAIT FOR ENCODER READINGS  
 ; RTL  
 ; PC,B31C0X  
 ; PC,CONDSP  
 ; PC,IRXC1  
 ; PC,PNE  
 ; PC,SEARXC  
 ; PC,CONDSP  
 ; PC,REXC  
 ; PC,IRXC2  
 ; SCRFIN  
 ; RTL  
 ; STATUS  
 ; SRCHTP  
 ; PC  
 ; CSECT SCNCOM  
 ; BLKW 1  
 ; WORD 0  
 ; BLKW 12  
 ; WORD 0  
 ; BLKW 26  
 ; WORD 0  
 ; WORD 0  
 ; CSECT XCCOM  
 ; BLKW 1  
 ; WORD 0  
 ; END

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR



REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

**F-86**

SYMBOL TABLE

BELL = ***** G	CHOUT = ***** C	COMAND 000976R	002	DSP	000634R	DXHIN 000132R	002
ERASE = ***** G	CETHR 000252R	CETSCR 000130R	002	HOME = ***** G	000000R	ICHBUF 000000R	003
FR 000452R	HR 000345R	RCDR 000050R	002	NCDRCV 000122R	000001	N9M = 000001	
NUHI = 000017	OUT 000252R	PC = 000003	002	QNCBR 000300R	R5 = 000005	R9 = 000009	
R1 = 000001	R2 = 000002	R3 = 000006	002	R4 = 000004	SRCHTP 000002R	R5 = 000005	
SCNF1N 000124R	SOURCE 000000R	SP 000006	002	TY1 000006R	STATUS 000034R	TY2 000014R	002
SI 000000RG	TX1 000004R	TX2 000012R	002	XLIN1 000066R	XLIN2 000072R		002
TZ1 000010R	TZ2 000016R	WRTLSI = ***** G	002				
YL1H1 000070R	YL1F2 000074R		002				
. ABS. 000000			000				
000644			001				
SCNCOH 000134			002				
TELCOH 000002			003				
ERRORS DETECTED: 0							
FREE CORE: 16742. WORDS							

.DK1:SIXC/R:TTM/E:LC-SIXC

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

1  .TITLE SCANXC
2  .CLOBL ARI,CONDEP,VRTLSI,SCANXC,LSIINT,B0100
3  .NCALL .REGDEF
4  .REGDEF
36 000000 026727 000000' 000001 SCANXC: CHP
37 000006 001401 BEQ
38 000010 000207 RTS
39 000012 000034' IS:
40 000024 005767 SAVE
41 000030 003021 TST
42 000032 004767 BCT
43 000036 012767 JSR
44 000044 005067 PULSE:
45 000050 012700 CLR
46 000054 004767 NCDRCV
47 000060 000126 JSR
48 000072 000207 OUT:
49 000074 005767 RTS
50 000100 001754 BECSCH:
51 000102 005067 BEQ
52 000105 012767 CLR
53 000114 005067 NOV
54 000120 005067 CLR
55 000124 005067 CLR
56 000130 012702 NOV
57 000134 012701 MOV
58 000140 012221 MOV
59 000142 012221 MOV
60 000144 012221 MOV
61 000146 012221 MOV
62 000150 016721 MOV
63 000154 016721 MOV
64 000160 005021 CLR
65 000162 005057 CLR
66 000166 012767 NOV
67 000174 012700 NOV
68 000200 004767 JSR
69 000204 000725 BR
70 000206 005267 INC
71 000212 042737 VRTLSI:
72 000220 000160' BIC
73 000224 012701 SAVE
74 000230 000311 MOV
75 000232 110011 SWAB
76 000234 012137 NOV
77 000240 052737 WRI:
78 000246 105737 BIS
79 000252 002375 TSTB
80 000254 042737 BCE
81 000262 105737 BIC
82 000266 002775 TSTB
83 000270 077017 BLT
84 000272 005367 SOB
85 000276 000166' UNSAVE
86 000302 000207 DEC
87 000000' .CSECT XCCOH
88 000000 .WORD 0

```

.TITLE SCANXC  
 .CLOBL ARI,CONDEP,VRTLSI,SCANXC,LSIINT,B0100  
 .NCALL .REGDEF  
 .REGDEF  
 SOURCE, #1  
 PC  
 01234  
 STATUS  
 BECSCH  
 PC,ARI  
 #3,COHAND  
 NCDRCV  
 #1,RO  
 PC,VRTLSI  
 43210  
 PC  
 SRCHTP  
 PULSE  
 SPEAK  
 #PD,PDPNTR  
 SCNF IN  
 TFCNT  
 SPCNT  
 #XLIHL,R2  
 #CHDAT,R1  
 (R2)+,(R1)+  
 (R2)+,(R1)+  
 (R2)+,(R1)+  
 (R2)+,(R1)+  
 AXIS,(R1)+  
 DEXIN,(R1)+  
 (R1)+  
 NCDRCV  
 #4,COHAND  
 #8,RO :EIGHT WORD COHAND  
 PC,VRTLSI  
 OUT  
 COHIP  
 #160,0167740  
 01  
 #COHAND,R1  
 (R1)  
 R0,(R1)  
 (R1)+,0167742  
 #2,0167740  
 0167740  
 IS  
 #2,0167740  
 0167740  
 23  
 R0,WR1  
 10  
 UNSAVE  
 DEC  
 COHIP  
 PC  
 .CSECT XCCOH  
 .WORD 0

;CHECK FOR REAL TIME DATA  
 ;IF NOT RETURN  
 ;CET FUNCTION REQUESTED  
 ;PULSE AND ENCODE  
 ;CLEAR "ENCODERS RECEIVED"  
 ;ONE WORD COHAND  
 ;SEND COHAND TO LSI-11  
 ;CET ADDRESS  
 ;CET AXIS OF SCAN  
 ;CET MINIMUM INCREMENT  
 ;CLEAR OFFSET SCAN FLAG  
 ;CLEAR "ENCODERS RECEIVED"  
 ;COHAND 4 = SCAN  
 ;EIGHT WORD COHAND  
 ;SEND COMMAND  
 ;DISABLE INTERRUPT  
 ;ADDRESS OF COMMAND BUFFER  
 ;SEND WORD  
 ;SET INTERRUPT  
 ;WAIT FOR ACKNOWLEDGE  
 ;CLEAR INTERRUPT  
 ;WAIT FOR '45 TO CLEAR  
 ;GO AROUND AGAIN  
 ;RETURN TO SCANXC  
 ;PEAK OF CURRENT PULSE

```

39 000002 000000      IRRO:      .WORD      0
90 000004 000000      SPEAK:     .WORD      0
91 000006 000000      XDRID:     .BLKW      6.
92 000014 000000      IIRCD:     .WORD      0
93 000016 000000      CTTHRES:   .WORD      0
94 000020 000000      PST1:      .WORD      0
95 000022 000000      FBY:       .WORD      0
96 000024 000000      FP:        .WORD      0
97 000026 000000      BP:        .WORD      0
98 000028 000000      ASTAT:     .WORD      0
99 000030 000000      :
100 000032 000000      POPRTR:    .WORD      0
101 000034 000000      LPADR:     .WORD      0
102 000036 000000      PCNT:      SUPTXT PCNT, PCNTE, < % >
103 000060 000097      PCNTE:     .WORD      7
104 000060 000097      YFACT:     .WORD      7
105 000062 000097      XOFF:      .WORD     162.
106 000064 000212      XOFF:      .WORD     30.
107 000066 000036      YOFF:      .BLKW     29.
108 000068 000000      :
109 000140 000090      ARACT:     .WORD      0
110 000142 000002      LBLMIN:    .WORD      0
111 000144 000000      OPCT:      .WORD      0
112 000146 000000      PPRTR:    .WORD      0
113 000150 000000      SDFLC:    .WORD      0
114 000152 000000      POSRD:     .WORD      0
115 000154 000000      PSCT:      .WORD      0
116 000156 000000      OP:
117
118 000156 000000      :
119 000322 000000      SFBP:      .BLKB     100.
120 000366 000000      FPOINT:   .BLKB     100.
121 000366 000000      BPOINT:   .BLKB     100.
122 000366 000000      PO:        .BLKW     1536.
123 000366 000000      POS:       .BLKB     1536.
124 001632 000000      PD:        .BLKW     10000.
125 000000 000000      :
126 000000 000000      SOURCE:   .WORD      0
127 000002 000000      SRCHTP:   .WORD      0
128 000004 000000      TX1:      .WORD      0
129 000006 000000      TY1:      .WORD      0
130 000010 000000      TZ1:      .WORD      0
131 000012 000000      TZ2:      .WORD      0
132 000014 000000      TZ3:      .WORD      0
133 000016 000000      TZ4:      .WORD      0
134 000020 000000      SX1:      .WORD      0
135 000022 000000      SY1:      .WORD      0
136 000024 000000      SZ1:      .WORD      0
137 000026 000000      SZ2:      .WORD      0
138 000028 000000      SZ3:      .WORD      0
139 000030 000000      STATUS:   .WORD      0
140 000032 000000      XDIR:     .WORD      0
141 000034 000000      YDIR:     .WORD      0
142 000036 000000      ZDIR:     .WORD      0
143 000038 000000      XPRNT:    .WORD      0
144 000040 000000      YPRNT:    .WORD      0
145 000042 000000      ZPRNT:    .WORD      0
146 000044 000000      NCPR:     .BLKW      7

```

REPRODUCIBILITY OF THE  
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146 000066	000000	XLIM1:	.WORD	0	
147 000070	000000	YLIM1:	.WORD	0	
148 000072	000000	XLIM2:	.WORD	0	
149 000074	000000	YLIM2:	.WORD	0	
150 000076	000000	COMAND:	.WORD	0	
151 000100	000000	CEPAT:	.BLKW	9.	
152 000122	000000	RCBRCV:	.WORD	0	
153 000124	000000	SCHFIN:	.WORD	0	
154 000126	000000	AXIS:	.WORD	0	
155 000130	000144	RUPPT:	.WORD	100.	
156 000132	000012	DXMIN:	.WORD	10.	
157 000134	000000	LSIDAT:	.BLKW	11.	
158 000162	000000	ERROR:	.WORD	0	
159 000164	000000	ARIVED:	.WORD	0	
160 000166	000000	COMIP:	.WORD	0	
161 000170	000000	SPCNT:	.WORD	0	
162	000000		.CSECT	DBCCOM	
163 000000	000000	TFCNT:	.WORD	0	
164	000001		.END		

;COMMAND TO LSI-11  
 ;COMMAND DATA  
 ;ERCODES RECEIVED FLAG  
 ;SCAN FINISHED FLAG  
 ;SCAN AXIS  
 ;NUMBER OF POINTS ON SCAN AXIS  
 ;MINIMUM INCREMENT IN X/Y PLANE  
 ;DATA FROM LSI-11  
 ;ERROR FLAG  
 ;COMMUNICATIONS IN PROGRESS  
 ;SCAN PASS COUNT

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

SYMBOL TABLE

ARACT	000140R	002	ARRIVED	000164R	003	ARRH = ***** G	002	ASTAT	000030R	002	AXIS	000126R	003
BESCH	000074R	003	BP	000026R	002	BPOINT	000466R	002	B3100 = ***** G	002	CHDAT	000100R	003
COHAB	000076R	003	COHIP	000166R	003	CORDSP = ***** G	002	CTHRES	000016R	002	EXHIN	000132R	003
EURR	000162R	003	FBY	000022R	002	FP	000024R	002	LSIDAT	000322R	002	INCND	000014R
IERQ	000062R	002	LRLMLH	000142R	002	LPADR	000034R	002	LSIDAT	000134R	003	LSINT = ***** G	002
KCDR	000050R	003	KCDRCV	000122R	003	NUM	000002	002	NUMINT	000130R	003	NUH1 = 000004	002
OP	000156R	002	OPCWT	000144R	002	OUT	000060R	002	PC	0000007	002	PCWT	000036R
PCITE	000060R	002	PD	011632R	002	PDPNTR	000146R	002	PEAK	000000R	002	FO	000032R
POINTR	000032R	002	PDS	000032R	002	POSEND	000152R	002	PCNT	000154R	002	FS1	000020R
PULSE	000032R	002	R0	0000000	002	R1	0000001	002	R2	0000002	002	R3	0000003
R4	0000004	002	R3	0000005	003	SRLC	000150R	002	SCANXC	000000RG	003	SCFIN	000124R
SFEP	000156R	002	SOURCE	000000R	003	SP	0000005	002	SPCNT	000170R	003	SPEAK	000004R
SRCUTP	000002R	003	STATUS	000034R	003	SK1	000020R	003	SX2	000026R	003	SY1	000022R
SY2	000030R	003	SZ1	000024R	003	SZ2	000032R	003	TYCHT	000000R	004	TX1	000004R
TZ2	000012R	003	TY1	000006R	003	TY2	000014R	003	TZ1	000010R	003	TZ2	000016R
WUTL31	000206RG	003	VR1	0000234R	003	XCRID	000096R	002	XDIR	000036R	003	XFACT	000060R
XLIM1	000066R	003	XLIM2	000072R	003	XOFF	000064R	002	XPNT	000042R	003	YDIR	000040R
YFACT	000062R	002	YLIM1	000070R	003	YLIM2	000074R	002	YOFF	000066R	003	YPNT	000044R
ZPNT	000046R	003											

ERRORS DETECTED: 0  
FREE CORE: 16589. WORDS

,DK1:SCANXC/R:TTT/E:LC=SCANXC

1		.TITLE SEARCH ;SEARCH TRANSDUCER CHARACTERIZATION WINDOW
2		.GLOBL SEARCH
3		.RECALL .REGDEF
4	600000	.REGDEF
5		:
6		: SEARCH SEARCHES THE TRANSDUCER
7		: CHARACTERIZATION WINDOW
8		:
9		: AND FINDS THE PEAK.
10	000000	SEARCH: TSTB
11	000004	TWDT+6
12	000006	DEC
13	000012	HVB
14	000016	HVB
15	000020	SUB
16	000022	BLE
17	000026	ADD
18	000030	CLR
19	000032	CHVB
20	000034	BLE
21	000040	HVB
22	000042	SUB
23	000046	RVS
24		.CSECT IBUF
25		.BLKW 14.
26	000034	.BLKW 2043.
27		.CSECT DSPCON
28		.BLKW 131
29	000062	.BLKW 32.
30	000062	.BLKW 3.
31		.CSECT MDCON
32	000000	.WORD 0
33	000001	.END



```

1  TITLE SPD :SCAN PEAK DATA
2  .GLOBL SPD
3  .MCALL CHTXT,SUPTXT,CHSTUP,SAVE,UNSAVE,.REGDEF
4  .REGDEF
5  SAVE 543
6  CLR FLBFP
7  CHP ASTAT,#2
8  BEQ 13
9  FLBFP
10 CLR
11 CLR ASTAT
12 MOV #SFBP,R4
13 CHP R4,#SFBP+100.
14 BHS SP3
15 TSTB (R4)+
16 BEZ SP2
17 HAVE FOUND ROW TO BE SEARCHED
18 MOV R4,R5
19 SUB #SFBP+1,R5
20 MUL #200,,R5
21 MOV BPOINT-SFBP-1(R4),R3
22 INC R3
23 ASL FLBFP,R3
24 MUL #PD,R5
25 ADD R5,SSTOP
26 ADD #200,,SSTOP
27 ADD R3,R5
28 CHP R5,SSTOP
29 BHS SP5,5
30 CHP (R5)+,CTHRES
31 BLT SP4
32 MOV R5,R3
33 SUB SSTOP,R3
34 ADD #193,,R3
35 ASL R3
36 MOV BPOINT-SFBP-1(R4),R3
37 CHP R5,SSTOP
38 BHI 13
39 CHP (R5)+,CTHRES
40 HGE SP5
41 MOV R5,R3
42 SUB SSTOP,R3
43 ADD #196,,R3
44 ASL R3
45 MOV BPOINT-SFBP-1(R4),R3
46 MOV R3,R4
47 MOV #1,-1(R4)
48 CHP #1,ASTAT
49 BR SP2
50 CLRB -1(R4)
51 BR SP2
52 UGSAVE 345
53 RTS PC
54 FLEMP: .WORD 0
55 SSTOP: .WORD 0
56 .CSECT
57 .WORD 0
58 .PEAK: 0
59 .IRRG: 0
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SEARXC  
IRXC2:PEAK OF CURRENT PULSE  
:INPUT RANGE CHANGE REQUEST FLAGIRXC  
IRXC

SPD

:SCAN PEAK DATA RT-11 MACRO VN02-12 21-NOV-79 PAGE 1+

53 000004 000000  
59 000006 000000  
60 000014 000000  
61 000016 000000  
62 000020 000000  
63 000022 000000  
64 000024 000000  
65 000026 000000  
66 000030 000000  
67 000032 000000  
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74 000064 000000  
75 000066 000000  
76 000140 000000  
77 000142 000000  
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90 000156 000000  
91 000156 000000  
92 000001

SPEAK: .WORD 0  
MCDRID: .BLKB 6.  
LRCHD: .WORD 0  
CTHRES: .WORD 0  
PS1: .WORD 0  
FBY: .WORD 0  
FP: .WORD 0  
BP: .WORD 0  
ASTAT: .WORD 0  
POPNTN: .WORD 0  
LPADR: .WORD 0  
PCNT: SUPTNT PCNT,PCNTE,< % >  
PCNTE: .WORD 7  
XFACT: .WORD 7  
YFACT: .WORD 162.  
XOFF: .WORD 30.  
YOFF: .BLKW 20.  
ARACT: .WORD 0  
LBLMIN: .WORD 0  
GPCNT: .WORD 0  
P9PNTN: .WORD 0  
SBFLG: .WORD 0  
POSEND: .WORD 0  
PSCNT: .WORD 0  
OP: .WORD 0  
SFBP: .BLKB 100.  
BPOINT: .BLKB 100.  
PO: .BLKB 100.  
POS: .BLKW 1536.  
PD: .BLKB 1536.  
PD: .BLKW 10000.  
END

;PEAK OF OVERALL SCAN (SO FAR)  
;TRANSDUCER IDENTIFICATION  
;INPUT RANGE COMMAND FOR BIOMATION  
;CURRENT CONTOUR LINT THRESHOLD  
;CURRENT POINT STATUS (FOR ORDER)  
;CURRENT Y VALUE  
;CURRENT 'FRONT' POINT  
;CURRENT 'BACK' POINT  
;ARRAY STATUS: 0=ALL POINTS IN ARRAY ON THRESHOLD HAVE BEEN FOUND BY  
1= SOME POINTS REMAIN, 2=BERGINING NEW ARRAY OR NEW THRESHOLD

; POINTER TO PO AND POS  
; ADDRESS OF LAST POINT PROCESSED BY ORDER  
; SCALE FACTOR FOR X AXIS OF DISPLAY  
; SCALE FACTOR FOR Y AXIS OF DISPLAY  
; X AXIS OFFSET FOR DISPLAY  
; Y AXIS OFFSET FOR DISPLAY  
; AUTO RANGING ACTIVE FLAG  
2 ; MINIMUM POINT COUNT FOR LINE TO BE LABELED  
; ORDERED POINT COUNT  
; POINTER TO PEAK DATA ARRAY  
; FLAG TO/FROM SBTWP  
; END OF PGS ARRAY  
; PASS COUNT  
; ORDERED POINTS OUT OF ORDER PROCESSING  
OP OVERLAYS SFBP,FRONT,AND BPOINT  
; STATUS OF F/B POINTS EXTRACTED BY SPD  
; FRONT POINTS EXTRACTED BY SPD  
; BACK POINTS EXTRACTED BY SPD  
; POINTS OUT OF FRONT/BACK OF CPLOT  
; STATUS OF PO POINTS  
; ARRAY OF PEAK DATA (100.X100.)

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

ARACT	00010R	002	ASTAT	000030R	002	BP	000026R	002	BPOINT	000466R	002	CTHRES	000016R	002
FHY	000022R	002	FLBHP	000242R	002	FP	000024R	002	FPOINT	000322R	002	IRCMD	000014R	002
IRRR	000002R	002	LBLMIN	000142R	002	LPADR	000034R	002	HUM	000002	002	NUH1	000004	002
OP	000156R	002	OPCNT	000144R	002	PC	=%000007	002	PCNT	000036R	002	PCNTE	000060R	002
PD	011632R	002	PDPNTR	000146R	002	PEAK	000000R	002	PO	000032R	002	POPTR	000032R	002
POS	000032R	002	POSEND	000152R	002	PSCNT	000154R	002	PS1	000020R	002	R0	=%000000	002
R1	=%000001	002	R2	=%000002	002	R3	=%000003	002	R4	=%000004	002	R5	=%000005	002
SHFLC	000150R	002	SFBP	000156R	002	SP	=%000006	002	SPD	000000RG	002	SPEAK	000004R	002
SP2	000036R	002	SP3	000050R	002	SP4	000116R	002	SP5	000152R	002	SP6.5	000224R	002
SP7	000206R	002	SPB	000232R	002	SSTOP	000244R	002	XDCRID	000006R	002	XFACT	000060R	002
XOFF	000064R	002	YFACT	000062R	002	YOFF	000066R	002						
.ABS.	000000	000												
XCON	000025	001												
ERRORS DETECTED:	000	002												
FREE CORE:	16347. WORDS													
.DK1:SPD/N:TIME/LC=SPD														

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

53	000242	001100		BNE	SBINS		
59	000244	005237	000022'	INC	FBY		;MOVE TO NEXT ROW
60	000250	025737	000022'	CMP	FBY, #100.		;IF OUT OF ARRAY, ASSUME BELOW
61	000256	002012		DCE	43		;CHECK THRESHOLD
62	000260	022701	000310'	ADD	#200, R1		
63	000264	026167	011632'	CMP	PD(R1), CTHRES		
64	000272	002104		BLT	43		
65	000274	005767	000212	TST	LPS		;CHECK LAST POINT'S STATUS
66	000300	001461		BEQ	SBINS		;IF 'BELOW' INSERT POINT
67	000302	000403		BR	53		
68	000304	005767	000202	TST	LPS		;CHECK LAST POINT'S STATUS
69	000310	001055		BNE	SBINS		;IF ABOVE, INSERT POINT
70	000312						
71	000312	011657	000022'	MOV	(SP), FBY		;GET ORIGINAL ROW
72	000316	027571		SOB	R5, S82		;DO NEXT COLUMN
73	000320	003726		TST	(SP)+		;SKIP OVER FBY
74	000322	012667	000029'	MOV	(SP)+, PS1		;RESTOR STATUS
75	000326	012601		MOV	(SP)+, R1		;GET OLD POPNTR
76	000330	005767	000156	TST	LPS		;CHECK FOR BACK FILL
77	000334	001437		BEQ	53		
78	000336	020167	000032'	CMP	R1, POPNTR		;CHECK FOR FILL JUST ADDED
79	000342	001434		BEQ	53		;IF NOT, SKIP
80	000344			SAVE	0234		
81	000354	005721		TST	(R1)+		
82	000356	010093		MOV	R0, R3		;INCREMENT BY TWO
83	000360	010104		MOV	R1, R4		;GET POINTERS TO POS
84	000362	160304		SUB	R3, R4		
85	000364	162703	000632'	SUB	#PO, R3		
86	000370	005293		ASR	R3		
87	000372	005304		ASR	R4		
88	000374	002703	000632'	ADD	#POS, R3		
89	000400	000304		ADD	R3, R4		
90	000402	020100		CMP	R1, R0		
91	000404	002607		ECE	43		;CHECK FOR FINISHED
92							
93	000406	012102		SWAP	ORDER OF FILL POINTS		
94	000410	014011		MOV	(R1)+, R2		
95	000412	010210		MOV	-(R0), (R1)		
96	000414	112402		MOV	R2, (R0)		
97	000416	114314		MOV	(R4)+, R2		
98	000420	110213		MOV	-(R3), (R4)		
99	000422	000767		BR	15		
100	000424			URSAVE	4326		
101	000434	012601		MOV	(SP)+, R1		;RESTORE R1
102	000436	012667	000025'	MOV	(SP)+, BP		
103	000442	000297		RTS	PC		
104	000444	110301		MOV	R3, R1		;GET X POINT
105	000446	000501		ADD	R5, R1		
106	000450	005767	000036	TST	LPS		;CHECK STATUS
107	000454	001402		BEQ	15		
108	000456	005367		DEC	FBY		;BACK UP ONE ROW
109	000462	010167		MOV	R1, BP		;SET UP STATUS
110	000466	016767	000020'	MOV	LPS, PS1		
111	000474	005367	000020'	ASL	PS1		
112	000500	005267	000020'	INC	PS1		
113	000504	004767	000000G	JSR	PC, INSP		;INSERT POINT
114	000510	000709		BR	SR0B		;GO FOR NEXT COLUMN

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115 000512 000000 ;LAST POINT STATUS FOR FILL SCAN
116 000000 ;PEAK OF CURRENT PULSE
117 000000 ;INPUT RANGE CHANGE REQUEST FLAG
118 000002 000000 ;PEAK OF OVERALL SCAN (SO FAR)
119 000004 000000 ;TRANSDUCER IDENTIFICATION
120 000006 000000 ;INPUT RANGE COMMAND FOR BIOKATION
121 000014 000000 ;CURRENT OUTTOUT LINT THRESHOLD
122 000016 000000 ;CURRENT POINT STATUS (FOR ORDER)
123 000020 000000 ;CURRENT Y VALUE
124 000022 000000 ;CURRENT 'FRONT' POINT
125 000024 000000 ;CURRENT 'BACK' POINT
126 000026 000000 ;ARRAY STATUS: 0=ALL POINTS IN ARRAY ON THRESHOLD HAVE BEEN FOUND BY
127 000030 000000 ;POINTER TO PO AND PGS
128 000032 000000 ;ADDRESS OF LAST POINT PROCESSED BY ORDER
129 000034 000000 ;SCALE FACTOR FOR X AXIS OF DISPLAY
130 000036 000000 ;SCALE FACTOR FOR Y AXIS OF DISPLAY
131 000038 000000 ;X AXIS OFFSET FOR DISPLAY
132 000040 000000 ;Y AXIS OFFSET FOR DISPLAY
133 000042 000000 ;AUTO RANGING ACTIVE FLAG
134 000044 000000 ;MINIMUM POINT COUNT FOR LINE TO BE LABELED
135 000046 000000 ;ORDERED POINT COUNT
136 000048 000000 ;POINTER TO PEAK DATA ARRAY
137 000050 000000 ;FLAG TO/FROM SBTVP
138 000052 000000 ;END OF POS ARRAY
139 000054 000000 ;PASS COUNT
140 000056 000000 ;ORDERED POINTS OUT OF ORDER PROCESSING
141 000058 000000 ;OP OVERLAYS SFBP,FRONT,AND BPOINT
142 000100 000000 ;STATUS OF F/B POINTS EXTRACTED BY SPB
143 000102 000000 ;FRONT POINTS EXTRACTED BY SPB
144 000104 000000 ;BACK POINTS EXTRACTED BY SPB
145 000106 000000 ;POINTS OUT OF FRONT/BACK OF C/PLOT
146 000108 000000 ;STATUS OF PO POINTS
147 000110 000000 ;ARRAY OF PEAK DATA (100.X100.)
148 000112 000000
149 000114 000000
150 000116 000000
151 000118 000000
152 000120 000000
153 000001'

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SYMBOL TABLE

ARACT	000140R	002	ASTAT	000030R	002	BP	000026R	002	BPPOINT	000466R	002	CTHRES	000016R	002
FBY	000022R	002	FP	000024R	002	FPOINT	000022R	002	INSP	***** G	002	IRCMD	000014R	002
IRRD	000002R	002	LBLHIN	000142R	002	LPADR	000034R	002	LPS	000512R	002	NOH	= 000002	002
NOH1	= 000004	002	OP	000156R	002	OPCNT	000144R	002	PC	= 0000007	002	PCNT	000036R	002
PCNTE	000050R	002	PD	011632R	002	PDPNTR	000146R	002	PEAK	000000R	002	PO	000032R	002
POPTR	000032R	002	POS	000632R	002	POSEND	000152R	002	PSCNT	000154R	002	PSI	000029R	002
R0	= 000000	002	R1	= 0000001	002	R2	= 0000002	002	R3	= 0000003	002	R4	= 0000004	002
R5	= 0000005	002	SBFLG	000150R	002	SBINS	000444R	002	SBOUT	000442R	002	SBSOB	000312R	002
SBTWP	000000RG	002	SB2	000136R	002	SFBP	000156R	002	SP	= 0000006	002	SPEAK	000004R	002
XDCRID	000005R	002	XFACT	000060R	002	XOFF	000064R	002	YFACT	000062R	002	YOFF	000066R	002

. ABS. 000000 000  
 000514 001  
 XDCRH 000072 002  
 ERRORS DETECTED: 0  
 FREE CORE: 16319. WORDS

,DK1:SBTWP/N:TTL/E:LC=SBTWP

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524
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TC RT-11 MACRO VHO2-12 21-NOV-79 PAGE 1+  
SYMBOL TABLE

[illegible]

— ୧୩୫୩୭୭୮୩୩୩୩ —

```

      .TITLE STUES
      .GLOBL BB1000
      .NCALL .RECALL
      .REGDEF BB1000
      B3100X: JNP
      BSETUP:
      S2:
      FCLOSE:
      WZSCAN:
      ZMOVE:
      RTS
      .END
      PC

```

SYMBOL TABLE

BR100 = \*\*\*\*\* C  
 R0 =%000000  
 R5 =%000005  
 . ARS. 000000 000  
 000005 001  
 ERRORS DETECTED: 0  
 FREE CORE: 17263. WORDS  
 ,DE1:STUBRC/H:TTM/E:LC=STUBMC

R3100X 000000RC  
 R1 =%000001  
 SP =%000006

DSETUP 000004RC  
 R2 =%000002  
 S2 000004RC

FCLOSE 000004RC  
 R3 =%000003  
 WZSCAN 000004RC

PC =%000007  
 R4 =%000004  
 ZHOVE 000004RC

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```

51 000146 012701 000000
52 000152 000167 000104
53 000156
54 000156 010045
55 000160 010136
56 000162 012700 000114
57 000166 012701 000002
58 000172 000167 000004
59 000176 000000 000206
    000204 000212 000000 001377
    000212 000000
60
61
62 000214
63 000214 010546
64 000216 012705 000176
65 000222 004767 000005
66 000226 004767 177614
67 000232 012605
68 000234 000207
69 000236 000
    000241 000
70
71 000242
72 000242 010946
73 000242 010146
74 000244 010146
75 000246 000236
76 000252 012701 000004
77 000256 000167 000000
78 000262
79 000262 103737 175614
80 000266 103735
81 000270 112637 175616
82 000274 077106
83 000276 012601
84 000300 012600
85 000302 000207
86 000304 000000
87 000306
88
89
90
91
92
93
94 000314
95 000314 010946
96 000316 010146
97 000320 010346
98 000322 010446
99 000324 012704 000213
100 000330 012704 000004 177746
101 000326 012705 000001
102 000342 017500 000002
103 000346 010031
104 000350 042700 176637
105

```

LF:                      BUF2:                      13:

MOV #6,R1  
JMP B010  
MOV R0,-(SP)  
MOV R1,-(SP)  
MOV #BUF1+6,R0  
MOV #2,R1  
JMP B010  
NORD 0,BUF2+10,BUF2+12,BUF2+14,0,767.,0

; POSITION CURSER UPPER LEFT SCREEN  
; CALL HOME  
HOME:  
MOV R5,-(SP)  
MOV #BUF2,R5  
JSR PC,1PL0T  
JSR PC,ALPHA  
MOV (SP)+,R5  
RTS PC  
BYTE 7,0,0,0

; RING BELL  
; CALL BELL  
BELL:  
MOV R0,-(SP)  
MOV R1,-(SP)  
MOV #BUF3,R0  
MOV #4,R1  
JMP B010  
B010:  
TSTB e=CSR  
BPL B010  
MOV (R0)+,e=DATO  
SOB R1,B010  
MOV (SP)+,R1  
MOV (SP)+,R0  
RTS PC  
NORD 0  
BLKB 6

; POSITION GRAPHICS CURSOR  
; CALL PLOTIX,IY,IPED  
; IX,IY=SCREER COORDINATES 0-1024  
; 1PER=1 PER DOWN  
; =0 PER UP  
; FIRST POINT MUST BE PER UP  
IPL0T:  
MOV R0,-(SP)  
MOV R1,-(SP)  
MOV R3,-(SP)  
MOV R4,-(SP)  
MOV #HUFF+5,R4  
MOV #4,LEH  
MOV #1,-(SP)  
MOV #2(R5),R0  
MOV R0,R1  
BIC #176037,R0

105 000354	012703	000005	MOV	#5,R3
106 000360	006200		ASR	R0
107 000362	077302		SOB	R3,2\$
108 000364	052700	000040	BIS	#40,R0
109 000370	042701	177740	BIC	#177740,R1
110 000374	052701	000100	BIS	#100,R1
111 000400	005716		TST	(SP)
112 000402	100002		BPL	5\$
113 000404	052701	000040	BIS	#40,R1
114 000410	110144		MOV	R1,-(R4)
115 000412	110044		MOV	R0,-(R4)
116 000414	005716		TST	(SP)
117 000416	100405		BHI	10\$
118 000420	005416		NEG	(SP)
119 000422	017500	000004	MOV	@4(R5),R0
120 000426	000167	177714	JMP	1\$
121 000432	017500	000006	MOV	@6(R5),R0
122 000436	001004		BNE	20\$
123 000440	005267	177640	INC	LEH
124 000444	112744	000035	MOV	#35,-(R4)
125 000450	016700	177630	MOV	LEN,R0
126 000454	105737	175614	TSTB	@CSR
127 000460	100375		BPL	25\$
128 000462	112437	175616	MOV	(R4)+,@DATO
129 000466	077006		SOB	R0,25\$
130 000470	005726		TST	(SP)+
131 000472	012604		MOV	(SP)+,R4
132 000474	012603		MOV	(SP)+,R3
133 000476	012601		MOV	(SP)+,R1
134 000500	012600		MOV	(SP)+,R0
135 000502	000207		RTS	PC

136				
137				
138				
139				
140 000504	004767	177936	JSR	PC,ALPHA
141 000510	010016		MOV	R0,-(SP)
142 000512	010146		MOV	R1,-(SP)
143 000514	016509	000002	MOV	2(R5),R0
144 000520	052700	000002	ADD	#2,R0
145 000524	017501	000002	MOV	@2(R5),R1
146 000530	000167	177526	JMP	D010
147 000534	000000		.WORD	
148 000536			.BLKW	
149				
150				
151				
152				
153				
154 000652	010046		MOV	R0,-(SP)
155 000654	010146		MOV	R1,-(SP)
156 000656	010246		MOV	R2,-(SP)
157 000660	012767	005910	MOV	#5910,CHS
158 000666	000167	000014	JMP	OUT
159 000672	010046		MOV	R0,-(SP)
160 000674	010146		MOV	R1,-(SP)
161 000676	010246		MOV	R2,-(SP)

2\$:				
5\$:				
10\$:				
20\$:				
25\$:				

CHOUT:				
CHS:				
PRBF:				
PRTV:				
PRTH:				

33.				
CALL PRVC(1BUF,N)				
CALL PRTH(1BUF,N)				
1BUF=CHARACTER BUFFER				
N=NUMBER OF CHARACTERS				
R0,-(SP)				
R1,-(SP)				
R2,-(SP)				
#5910,CHS				
OUT				
R0,-(SP)				
R1,-(SP)				
R2,-(SP)				

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

162	000709	012767	000010	177626	MOV	#40, CHS
163	000706	004767	177154		JSR	PC, ALPHA2
164	000712	017500	000004		MOV	@4(R5), R0
165	000716	012702	000036		MOV	#PRBF, R2
166	000722	016591	000002		MOV	2(R5), R1
167	000726	112122			MOV	(R1)+, (R2)+
168	000730	116722	177600		MOV	CHS, (R2)+
169	000734	116722	177575		MOV	CHS+1, (R2)+
170	000740	077006			SOB	R9, L10
171	000742	017501	000004		MOV	@4(R5), R1
172	000746	070127	000003		MUL	#3, R1
173	000752	012692			MOV	(SP)+, R2
174	000754	012700	000536		MOV	#PRBF, R0
175	000760	003267	000022		INC	LELOP
176	000764	000167	177272		JNP	BO10
177	000770	003367	000242		INC	WTSE
178	000774	000002			RTI	
179	000776	000000			PSTAT:	.WORD 0
180	001000	000000			INTLOC:	.WORD 0
181					:	ALLOW GRAPHIC INPUT FROM JOYSTICK
182					:	CALL GRINCIALPHA, IX, IY
183					:	PLACES GRAPHIC CROSSHAIR ON SCREEN
184					:	COORDINATE IS TRANSMITTED WHEN ANY KEYBOARD CHARACTER
185					:	RETURNS: ALPHA=KEYBOARD CHARACTER
186					:	IX, IY=SCREEN COORDINATES 0-1024
187	001002	010046			MOV	R0, -(SP)
188	001004	010146			MOV	R1, -(SP)
189	001006	005067	000214		CLR	CBF
190	001012	005037	000223		CLR	WTSE
191	001016	005237	000100	175610	BIS	#100, @WCSR
192	001024	005237	175614		TSTB	@WCSR
193	001030	003375			BPL	C1
194	001032	112737	000021	175516	MOV	#21, @DATA
195	001040	012737	000770	000370	MOV	#GINT, @TTV
196	001046	012701	000097		MOV	#7, R1
197	001052	012700	001237		MOV	#CBF+1, R0
198	001056	005767	000154		TST	WTSE
199	001062	001775			BEQ	C2
200	001064	113720	175612		MOV	@DATA1, (R0)+
201	001070	005057	000142		CLR	WTSE
202	001074	005237	000100	175610	BIS	#100, @WCSR
203	001102	077113			SOR	R1, C2
204	001104	012737	001274	000370	MOV	#TTINT, @TTV
205	001112	000367	000110		SWAB	CBF
206	001116	012701	000002		MOV	#2, R1
207	001122	016700	000102		MOV	CBF+2, R0
208	001126	000300			SWAB	R0
209	001130	006309			ASLB	R0
210	001132	006300			ASLB	R0
211	001136	072037	177775		ASH	#-3, R0
212	001142	042700	176000		BIC	#170000, R0
213	001146	017575	000005	000004	MOV	@6(R5), @4(R5)
214	001154	016975	000005		MOV	R0, @6(R5)
215	001160	016700	000046		MOV	CBF+4, R0
216	001164	077120			SOB	R1, C3
217	001166	016775	000034	000002	MOV	CBF, @2(R5)

```

219 001174 026727 000026 000033 GBF,#33 ;CHECK FOR ESCAPE
220 001202 001457 ESCAPE
221 001204 162775 000007 000004 #7,@4(R5)
222 001212 003002 000004 13
223 001214 005075 @4(R5)
224 001220 012601 MOV (SP)+,R1
225 001222 012600 MOV (SP)+,R0
226 001224 000207 RTS PC
227 001226 000000 .BLKW 4
228 001236 000000 .WORD 0
229 001236 000000 ; ENABLE UNSOLICITED SINGLE CHARACTER INPUT FROM TERMINAL TO TEKCON
230 001236 000000 ; COMMON/TEKCON/ICHBUF
231 001236 000000 ; CALL TEKIN
232 001236 012737 001274' 000370 MOV #TTINT,@TTV
233 001236 005037 000372 000370 CLR @TTV+2
234 001236 052737 000100 175610 BIS #100,@WCSR
235 001260 052737 000260 175614 BIS #200,@CSR
236 001266 005067 000000' 000000' CLR ICHBUF
237 001272 006207 175612 000000' TTINT: MOVB @DATA1,ICHBUF
238 001274 113767 026727 000000' 000033 CNP ICHBUF,#33
239 001302 001414 000000' 000021 CNP ICHBUF,#21
240 001310 001426 000000' 000022 BEQ ICHBUF,#22
241 001312 026727 000000' 000022 STOP
242 001320 001426 000000' 000022 BEQ ICHBUF,#22
243 001322 026727 000000' 000022 BEQ ICHBUF,#22
244 001330 001422 000000' 000022 BEQ ICHBUF,#22
245 001332 052737 000100 175610 TTINT1: BIS #100,@WCSR
246 001340 000002 000000' 000000' RTI
247 001342 012767 000110 000000' ESCAPE: MOV #110,ICHBUF
248 001350 012667 177424 000000' (SP)+,INTLOC
249 001354 012667 177416 000000' (SP)+,PSTAT
250 001360 012706 001009 000000' #STBASE,SP
251 001364 016746 177405 000000' PSTAT,-(SP)
252 001370 012746 000000' 000000' CNP ICHBUF,-(SP)
253 001374 000756 000166' 000166' BR TTINT1 ;CHECK COMMUNICATION IN PROGRESS
254 001376 005767 000166' 000166' STOP: CNP ICHBUF,-(SP)
255 001402 001022 000000' 000000' BNE TTINT2 ;CHECK INTERRUPT JUST ARRIVED
256 001404 005737 167740 000000' TTINT2: @167740
257 001410 002417 000000' 000000' BLT TTINT2
258 001412 010046 000000' 000076' MOV R0,-(SP)
259 001414 012767 000000' 000000' MOV #5,COMAND
260 001422 012700 000001 000021 CNP ICHBUF,#21
261 001426 026727 000000' 000021 BEQ ICHBUF,#21
262 001434 001402 000000' 000000' CLR COMAND
263 001436 005067 000000' 000000' CLR PC,UTLISI
264 001442 004767 000000' 000000' MOV (SP)+,R0
265 001446 012600 000000' 000000' IS: ICHBUF
266 001450 005067 000000' 000000' TTINT2: CLR ICHBUF
267 001454 052737 000100 175610 BIS #100,@WCSR
268 001462 000002 000000' 000000' RTI
269 001462 000000' 000000' .CSECT SCRCON
270 001462 000000' 000000' .WORD 0
271 000076 000000' 000000' .COMAND: .BLKW 27
272 000000 000000' 000000' .COMIP: .WORD 0
273 000166 000000' 000000' .ICHBUF: .TEKCON
274 000000 000000' 000000' .WORD 0
275 000000 000000' 000000' .WORD 0

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS GOOD

TEKION RT-11 MACRO VM02-12 21-NOV-79 PAGE 14

LBLUP: .WORD 0  
.END

226 000002 000000  
227 000001

000306R  
RUEF



```

;CET WINDOW ADDRESS FROM PLW
;ADDRESS TO SEND DATA TO PLW
;TRANSFER WINDOW

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RT-11 HACRO VM2-12 21-NOV-79 PAGE 1+

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REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

TWIRDX RT-11 MACRO VM32-12 21-NOV-79 PAGE 1+

SYMBOL TABLE

BLACKH	0000000R	003	CHOUT = ***** G	000114R	000476R	0001424R	004
BTPE	000000R	004	D1	000556R	000560R	000564R	003
B+	000516R		D5	000542R	000460R	000356R	003
CHUD	000450R	004	HOHE = ***** G	000000R	000004R	000010R	004
HINK	000002R		HINY	000001	000041	000076R	003
OUT	000320R		OUT1	000332R	000350R	000060R	
PLV = ***** G			PPT	000372R	000240R	000276R	003
RECHUH	000002R	003	RENR	000000R	000142R	000144R	003
RVHD	000400R		R0	000000	000002	0000003	005
R+ = 0000004			R3	0000005	000006	000010R	
STARTX	000002R	005	STAT	000576R	000436R	000000RG	
TGHD	000262R	004	TWDT	000362R	000122R	000072R	004
WCHER	000414R	004	WINT = ***** G	000142R	000700R	0001424R	004
WTP	000412R	004	XDCRID	000100R	000016R	000376R	004
XWH	000406R	004	XNL	000402R	000400R	000024R	004
YLO	000022R	004	YWH	000410R	000014R		004
. ABS.	000000	000					
	001426	001					
TEKCOH	000002	002					
RCDCOH	000166	003					
DETCOH	000420	004					
RTKCOH	000012	005					

WORDS DETECTED: 0

FREE CORE: 16445. WORDS

. DEL: TWIRDX/N: TTVE/LC=TWIRDX



URPACK RT-11 MACRO VHS2-12 21-NOV-79 PAGE 1+  
SYMBOL TABLE

IBUF 000034R 002 PACK 000014RG PC R0 R1 R2 R3 R4 R5 R6 R7 R8 R9  
R2 =%000002 =%000000 =%000000 =%000000 =%000000 =%000000 =%000000 =%000000 =%000000 =%000000  
URPACK 000000RG  
. ABS. 000000 000  
IBUF 010034 001  
IBUF 010034 002  
ERRORS DETECTED: 0  
FREE CORE: 17109, WORDS

, DEL: URPACK/H: TTH/E: LC=URPACK





## SYMBOL TABLE

[illegible]

1	XCAXIS	RT-11	MACRO	V02-12	21-NOV-79	PAGE 1
2	1	2	3	4	5	6
3	7	8	9	10	11	12
4	13	14	15	16	17	18
5	19	20	21	22	23	24
6	25	26	27	28	29	30
7	31	32	33	34	35	36
8	37	38	39	40	41	42
9	43	44	45	46	47	48
10	49	50	51	52	53	54
11	55	56	57	58	59	60
12	61	62	63	64	65	

```

TITLE XCAXIS
.CLOBL XCAXIS, CHOUT, IPLOT
.HCALL .REGDEF, CHTXT, CKSTUP, SUPTXT, SAVE, UNSAVE
.HCALL .DATE, ...V2...
.V2...
.XCAXIS: SAVE
MOV 012345
ASL PRUM, R1
MOV RTBL(R1), MPNT2
; GET PLOT #
; GET ADDRESS OF MESSAGE
; GET TRANSDUCER AND BALL ID'S
; GET BALL ID
; GET XDOUCER ID
; GET DATE AND CONVERT
; GET X AND CONVERT
; YOUT, BADR
; TXI, WADR
; PC, B2AD
; YOUT, BADR
; TXI, WADR
; PC, B2AD

```

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```

66 000264 012767 002210' 000472
67 000272 012767 000010' 000452
68 000300 004767 000374
69
70
71 000304 005767 000600'
72 000310 001101
73 000312 005767 000370'
74 000316 001476
75 000320 016701 000002'
76 000324 070127 000012'
77 000330 066701 000006'
78 000334 070127 000012'
79 000340 066701 000012'
80 000344 070127 000012'
81 000350 016700 000012'
82 000354 016702 000016'
83 000360 160002
84 000362 005202
85 000364 000201
86 000366 000100
87 000370 170127 040200
88 000374 177003
89 000376 016702 000002'
90 000402 000302
91 000404 177162 001102'
92 000410 171100
93 000412 177027 073310
94 000416 171100
95 000420 177027 023420
96 000424 174500
97 000426 170012
98 000430 175557
99 000434 016700 000336
100 000440 016701 000324
101 000444 012703 000005
102 000450 012702 002302'
103 000454 071027 000012
104 000460 010001
105 000462 005000
106 000464 071027 000012
107 000470 062701 000000
108 000474 020327 000002
109 000500 001002 000006
110 000502 112742
111 000506 110142
112 000510 077315
113 000512 000411
114 000514 012767 025052
115 000522 012767 001546
116 000530 012767 025042
117 000536 005057 000210
118 000542 012700 001126'
119 000546 012701 000017
120 000552 012037 000226
121 000556 012037 000224
122 000562 002404

```

; ZOUT, BADR  
; TZ1, VADR  
PC, B2AD  
GET TOTAL WINDOW DELAY AND CONVERT  
TO DISTANCE IN INCHES DECIMAL ASCII.  
TST  
TUTS  
BNE  
CRVRR  
TWD+6  
CHVRR  
TDLX1, R1  
#10., R1  
TDLX2, R1  
#10., R1  
TDLX3, R1  
#10., R1  
TWD+43., R0  
TWD+52., R2  
R0, R2  
R2  
R2, R1  
R1, R0  
#40200  
R0, AC0  
IRNG, R2  
R2  
RTBL(R2), AC1  
AC0, AC1  
#30403., AC0  
AC0, AC1  
#10000., AC0  
AC0, AC1  
AC1, DTMP  
DTMP, R0  
DTMP+2, R1  
#5., R3  
#ESC12+12., R2  
#10., R0  
R0, R1  
R0  
#10., R0  
#60, R1  
R3, #2  
X5  
#1., -(R2)  
R1, -(R2)  
R3, X4  
R0UT  
#\*\*\*, MSG13+6  
#\*\*\*, MSG13+3.  
#\*\*\*, MSG13+10.  
IP  
#HLST, R0  
#15., R1  
(R0)+, IX  
(R0)+, IY  
25

; GET Z AND CONVERT  
; GET MSD OF TRIG. DELAY  
; ADD 2ND DIGIT  
; ADD LSD  
; GET BEGINNING OF WINDOW  
; GET WINDOW LENGTH  
; GET HIDDLE OF WINDOW  
; TOTAL DELAY IN R0  
; SET UP FPP  
; GET CONVERSION FACTOR

; INSERT STARS  
; OUTPUT MESSAGES

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001066	055	117	103		
001071	124	055	116		
001074	117	126	035		
001077	104	105	103		
163 001102	000031	000092	000035	RTBL:	.WORD 1,2,5,10.,20.,50.,100.,200.,500.,1000.
001110	000012	000024	000062		
001116	000144	000310	000764		
001124	001750				
169 001126	000322	001370	001549	MLST:	.WORD 210.,700.,MSC1,-1,-1
001134	177777	177777			
170 001140	000080	177777	177777	HPWT2:	.WORD 0,-1,-1,NSC6
001156	001736				
171 001150	000430	001344	001764		
001156	001560	001306	002042		
172 001164	001560	001262	002034		
001172	001560	001212	002074		
173 001200	001560	001166	002116		
001206	001560	001142	002136		
174 001214	001560	001116	002154		
001222	001560	001072	002172		
175 001230	001560	001022	002210		
001236	001560	000776	002236		
176 001244	001560	000752	002244		
001252	001560	000726	002266		
177 001260	000242	001332	001536	PLST:	.WORD 162.,730.,862.,30.,162.,30.
001266	000036	000242	000036		
178 001274	001336	001332	000214		
001282	001332	000214	000036		
179 001310	000242	000912	001536		
001316	000912	000202	001332		
180 001324	000226	001332	000202		
001332	001293	000226	001263		
181 001340	000292	001053	000226		
001346	001053	000202	000724		
182 001354	000226	000724	000226		
001362	000574	000226	000574		
183 001370	000202	000446	000226		
001376	000446	000292	000315		
184 001404	000226	000315	000202		
001412	000156	000226	000156		
185 001420	000202	000036	000226		
001426	000036	000242	000036		
186 001434	000242	000024	000371		
001442	000000	000371	000024		
187 001450	000521	000000	000521		
001456	000024	000050	000000		
188 001464	000050	000024	000024		
001472	000000	001050	000024		
189 001500	001127	000036	001127		
001506	000024	001237	000000		
190 001514	001257	000024	001406		
001522	000039	001406	000624		
001530	001536	000000	001536		
001536	000024				
191 001540					
192 001556					
193 001620					

SUPTXT MSC1,MSG2,<CONTOUR PLOT OF >,1  
 SUPTXT MSC2,MSG3,<90.,>,1  
 SUPTXT MSC3,MSG4,<,70>,1

194 001652  
195 001704  
196 001736  
197 001764  
198 002042  
199 002054  
200 002074  
201 002116  
202 002136  
203 002154  
204 002172  
205 002210  
206 002226  
207 002244  
208 002266  
209 002306  
210  
211  
212 000004  
213 000006  
214 000010  
215 000000  
216  
217 000262  
218 000362  
219  
220 000000  
221 000002  
222 000004  
223 000006  
224 000014  
225 000016  
226 000020  
227 000022

000000  
000000  
000000  
000000  
000000

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SUPTXT MSG4,MSG5,< , , 50, , , 30>,1  
SUPTXT MSG5,MSG6,< , , 50, , , 30>,1  
SUPTXT MSG6,MSG7,< PERCENT SIGNAL>,1  
SUPTXT MSG7,MSG8,< TRANSDUCER  
SUPTXT MSG8,MSG9,< DATE>,1  
SUPTXT MSG9,MSG10,< , , 50, , , 30>,1  
SUPTXT MSG10,MSG11,< COORDINATES>,1  
SUPTXT MSG11,MSG12,< OF CENTER>,1  
SUPTXT MSG12,MSG13,< X= >,1  
SUPTXT MSG13,MSG14,< Y= >,1  
SUPTXT MSG14,MSG15,< Z= >,1  
SUPTXT MSG15,MSG16,< WINDOWED>,1  
SUPTXT MSG16,MSG17,< DISTANCE>,1  
SUPTXT MSG17,MSG18,< FROM TRANSDUCER>,1  
SUPTXT MSG18,MSG19,< IN>,1

.CSECT SCNGCON  
.BLKW 2.  
.WORD 0  
.WORD 0  
.WORD 0  
.CSECT BSPCON  
.BLKW 131  
.BLKW 32.  
.BLKB 8.  
.CSECT XCCON  
.WORD 0  
.WORD 0  
.WORD 0  
.WORD 6.  
.WORD 0  
.WORD 0  
.WORD 0  
.WORD 0

PEAK: ; PEAK OF CURRENT PULSE  
IRRG: ; INPUT RANGE CHANGE REQUEST FLAG  
SPEAK: ; PEAK OF OVERALL SCAN (SO FAR)  
XDCRID: ; TRANSDUCER IDENTIFICATION  
IRCHID: ; INPUT RANGE COMMAND FOR BIORATION  
CTHRES: ; CURRENT CONTOUR LINT THRESHOLD  
PS1: ; CURRENT POINT STATUS (FOR ORDER  
PEY: ; CURRENT Y VALUE

SEARXC  
IRXC2

IRXC  
IRXC

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227	000022	000000	.WORD	0	;	CURRENT Y VALUE
228	000024	000000	.WORD	0	;	CURRENT 'FRONT' POINT
229	000026	000000	.WORD	0	;	CURRENT 'BACK' POINT
230	000030	000000	.WORD	0	;	ARRAY STATUS: 0=ALL POINTS IN ARRAY ON THRESHOLD HAVE BEEN FOUND BY
231						1= SOME POINTS REMAIN, 2=BERGINING NEW ARRAY OR NEW THRESHOLD
232	000032	000000	.WORD	0	;	POINTER TO PQ AND POS
233	000034	000000	.WORD	0	;	ADDRESS OF LAST POINT PROCESSED BY ORDER
234	000036		SUPTXT	PCNT,PCNTE,< % >		
235	000060		PCNTE:			
236	000060	000007	.WORD	7	;	SCALE FACTOR FOR X AXIS OF DISPLAY
237	000062	000007	.WORD	7	;	SCALE FACTOR FOR Y AXIS OF DISPLAY
238	000064	000242	.WORD	162.	;	X AXIS OFFSET FOR DISPLAY
239	000066	000036	.WORD	30.	;	Y AXIS OFFSET FOR DISPLAY
240			.BLKW	19.		
241	000136	000000	.WORD	0	;	PLOT COUNT
242		000000	.CSECT	RCDCOM		
243			.BLKB	106		
244			.BLKB	6		;
245	000106		.CSECT	IBUF		SAMPLE ID
246	000000	000000	.WORD	0		
247	000002	000000	.WORD	0		
248		000000	.CSECT	ATPARA		
249	000000	000000	.WORD	0		
250	000002	000000	.WORD	0		

XCARIS RT-11 MACRO MFC2-12 21-NOV-79 PAGE 1+

251 000004 000000  
252 000006 000000  
253 000010 000000  
254 000012 000000  
255 000001

TDLY2: .WORD 0  
TDLY3: .WORD 0  
      : .WORD 0  
      : .END

SYMBOL TABLE	
AC09	=%000000
AC5	=%000005
CHOUT	= ***** C
FP	000024R
11UR	000002R
NEXT	001126R
NEXT	001540R
NEXT	002172R
NEXT	001566R
NEXT	001764R
NUH	= 000004
PEAK	000000R
PS1	000020R
R3	=%000003
SPEAK	000004R
TWMT	000036R
XCAXIS	000000RG
X4	000460R
YOUT	002172R
ADS	000000
SCNCOM	000012
DSPCOM	000372
XCCOM	000140
IBUF	000014
ATTARA	000014
ERRORS DETECTED:	0
FREE CORE:	16196. WORDS
AC1	=%000001
ASTAT	000030R
CHVEH	000514R
IP	001002R
IUTS	000000R
MONTHS	001022R
HSG10	002074R
HSG15	002210R
HSG3	001620R
HSCB	002042R
PC	=%000007
PLST	001250R
RTBL	001102R
R4	=%000004
TDLY1	000002R
TX1	000034R
XDCRID	000036R
X4.5	000034R
ZOUT	002210R
AC2	=%000002
BADR	000764R
CTHRES	000016R
IPLAT	= ***** G
IX	001004R
MOUT	000536R
MSG11	002116R
MSG16	002226R
MSG4	001652R
NSC9	002054R
PCALL	000766R
PNUH	000136R
R0	=%000000
R5	=%000005
TDLY2	000006R
TY1	000006R
XFACT	000060R
X5	000506R
...V2	= 000001
AC3	=%000003
DP	000026R
DTMP	000776R
IRCHD	000014R
IY	001006R
NPNT2	002136R
HSG12	002244R
HSG17	001704R
HSG5	001010R
HTBL	000036R
PCNT	000032R
POPNT	=%000001
R1	000106R
SNPLID	000012R
TDLY3	000010R
TZ1	000064R
XOFF	000062R
YFACT	000062R
AC4	=%000004
H2AD	000700R
FBY	000022R
IRNG	000002R
LPADR	000034R
HSGE	002366R
HSG13	002154R
HSG18	002266R
HSG6	001736R
HUN	= 000002
PCNTE	000060R
POUT	000064R
R2	=%000002
SP	=%000006
TVND	000262R
WADR	000762R
XOUT	002154R
YOFF	000066R

.DK1: XCAXIS/N: TTW/E: LC=XCAXIS



SYMBOL TABLE

BRCXC = \*\*\*\*\* G  
 DISPCX = \*\*\*\*\* G  
 R0 = %000000  
 R5 = %0000005  
 XC 00000000C  
 . ABS. 000000 000  
 NTRCON 000002 001  
 TRKCON 000002 002  
 TRKCON 000002 003  
 ERRORS DETECTED: 0  
 FREE CORE: 17217. WORDS

RSETUP = \*\*\*\*\* C  
 ICHBUF 000000R 003  
 R1 = %000001  
 SCANXC = \*\*\*\*\* G  
 XC1 000012R  
 CHTCAL 000012RC  
 PC = %000007  
 R2 = %000002  
 SP = %000006  
 ZHOVE = \*\*\*\*\* G

CNTRXC = \*\*\*\*\* C  
 RENTR 000000R 002  
 R3 = %000003  
 UNPACK = \*\*\*\*\* C  
 CONDSP = \*\*\*\*\* C  
 RTL = \*\*\*\*\* C  
 R4 = %000004  
 WZSCAN = \*\*\*\*\* C

,DK1:XC/N:TTH/E:LC=XC

1	000000	004767	000000G	ZOOH:	.TITLE	ZOOHXC	
2	000000	012705	001062		.GLOBL	ZOOH,GRIN,HOME,CHOUT	
3	000000	004767	000000G		.HCALL	SAVE,UNSAVE,CHTXT,CHSTUP,SUPTXT,.RECDEF	
4	000000	012705	001062		.RECDEF		
5	000000	004767	000000G		SAVE	012345	
6	000000	012705	001062		JSR	PC,HOME	
7	000000	004767	000000G		MOV	#ZREG,R5	
8	000000	012705	001062		JSR	PC,CHOUT	
9	000000	004767	000000G		MOV	#GCALL,R5	
10	000000	012705	001062		JSR	PC,GRIN	
11	000000	004767	000000G		MOV	TBL1,R1	
12	000000	012705	001062		HUL	#10.,R1	
13	000000	004767	000000G		ADD	TBL2,R1	
14	000000	012705	001062		HUL	#10.,R1	
15	000000	004767	000000G		ADD	TBL3,R1	
16	000000	012705	001062		HUL	#10.,R1	
17	000000	004767	000000G		MOV	R1,DELY	
18	000000	012705	001062		MOV	IX,R9	
19	000000	004767	000000G		SUB	#100.,R9	
20	000000	012705	001062		SUB	X9,R9	
21	000000	004767	000000G		MOV	STOPX,R2	
22	000000	012705	001062		SUB	STARTX,R2	
23	000000	004767	000000G		INC	R2	
24	000000	012705	001062		MOV	R2,CLEN	
25	000000	004767	000000G		MOV	X11,R2	
26	000000	012705	001062		SUB	X10,R2	
27	000000	004767	000000G		HUL	R2,R9	
28	000000	012705	001062		DIV	#999.,R9	
29	000000	004767	000000G		SUB	MINX,R9	
30	000000	012705	001062		HUL	CLEN,R9	
31	000000	004767	000000G		MOV	MAXX,R2	
32	000000	012705	001062		SUB	MINX,R2	
33	000000	004767	000000G		DIV	R2,R9	
34	000000	012705	001062		ADD	STARTX,R9	
35	000000	004767	000000G		ADD	DELY,R9	
36	000000	012705	001062		MOV	R0,IX	
37	000000	004767	000000G	000111	CHP	ALPHA,#111	
38	000000	012705	001062	000117	BEQ	ZIR	
39	000000	004767	000000G		CHP	ALPHA,#117	
40	000000	012705	001062		BEQ	ZOUT	
41	000000	004767	000000G		CLR	RENTX	
42	000000	012705	001062		JMP	FIN	
43	000000	004767	000000G	004000	CHP	CLEN,#2043	
44	000000	012705	001062		BCE	DRAT	
45	000000	004767	000000G		CLR	STARTX	
46	000000	012705	001062		BEG	TACT	
47	000000	004767	000000G		MOV	CLEN,R2	
48	000000	012705	001062		ASL	R2	
49	000000	004767	000000G		MOV	R2,STOPX	
50	000000	012705	001062	001036	MOV	IX,DELY	
51	000000	004767	000000G	001039	SUB	CLEN,DELY	
52	000000	012705	001062	023406	CHP	DELY,#9990	
53	000000	004767	000000G		BCT	IX	
54	000000	012705	001062		TST	DELY	
55	000000	004767	000000G		BCT	IX	
56	000000	012705	001062		CLR	DELY	
57	000000	004767	000000G		BR		

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58 000324 016757 001000 000002' 13:      DELY, STARTX
59 000332 012757 023406 000770          #999., DELY
60 000340 165757 000764 000002'          DELY, STARTX
61 000346 065757 000002' 000003'        STARTX, STOPX
62 000354 025727 000004' 004000        STOPX, #2043.
63 000362 003411          23
64 000364 162757 004000 000004'        #2043., STOPX
65 000372 165757 000004' 000002'        STOPX, STARTX
66 000400 012767 004000 000004'        #2043., STOPX
67 000406 009167 000360          ERCD
68 000412 016704 000002'          IRNG, R4
69 000416 006304          R4
70 000420 016404          HSR+2(R4), R4
71 000424 026727 000002' 000011        IRNG, #9.
72 000428 002420          BLT
73 000434 005067          IRNG
74 000440 005267          IUTS
75 000444 026727 000000' 000002'        IUTS, #2
76 000452 003410          RNCUP
77 000454 012764          #1, R4
78 000460 012767 000010 000002'        #3., IRNG
79 000466 012767 000002' 000000'        #2, IUTS
80 000474 005267 000002'          IRNG
81 000500 016701          IX, R1
82 000504 005000          R9
83 000506 071094          R4, R9
84 000510 020427          R4, #5
85 000514 001001          13
86 000516 006300          R9
87 000520 162700          #1024., R0
88 000524 010967          R0, DELY
89 000530 005067          STARTX
90 000534 012767 004000 000004'        #2043., STOPX
91 000542 000556          BR
92 000544 016704          DCHK
93 000550 006304          IRNG, R4
94 000552 016404          R4
95 000556 005767          HSR(R4), R4
96 000562 003004          TST
97 000564 005767          IRNG
98 000570 003001          13
99 000572 000420          IUTS
100 000574 016700          13
101 000600 070024          35
102 000602 020427          IX, R0
103 000606 001003          R4, R9
104 000610 071027          R4, #5
105 000616 010001          23
106 000618 010167          #2, R0
107 000622 052701          R9, R1
108 000626 020127          R1, RSRX
109 000632 003439          #1024., R1
110 000634 005657          R1, #12000.
111 000640 005267          IRATE
112 000644 016702          STARTX
113 000650 006292          IACT
114 000652 020227          CLN, R2
          R2
          R2, #16.

; DECREASE SAMPLE RATE
; CHECK MAX RANGE
; INCREASE SAMPLE INTERVAL
; CALCULATE DELAY
; SET START AND STOP
; ZOOM IN
; CHECK SAMPLE RATE
; HALF #POINTS
; CHECK LOWER BOUND

```



168 000014 000000	.WORD 0
169 000016 000000	.WORD 0
170 000020 000000	.WORD 0
171 000000 000000	.CSECT ATPARA
172 000000 000000	.WORD 0
173 000002 000000	.WORD 0
174 000004 000000	.WORD 0
175 000006 000000	.WORD 0
176 000010 000000	.WORD 0
177 000012 000000	.WORD 0
178 000000 000000	.CSECT NTRCOM
179 000000 000000	.WORD 0
180 000002 000000	.WORD 0
181 000004 000000	.WORD 0
182 000000 000000	.CSECT IBUF
183 000000 000000	.WORD 0
184 000002 000000	.WORD 0
185 000001 000001	.END

XLO:

XHI:

TDLY1:

TDLY2:

TDLY3:

RENTX:

STARTX:

STOPX:

IUTS:

IRUG:

SYMBOL TABLE

CHOUT = ***** C	CLEN	001332R	DCHK	000300R	DELY	001330R	DRAT	000412R	
END = 000772R	END	001310R	FIN	001044R	CCALL	001312R	GRIN	= ***** G	005
HOME = ***** C	IACT	001364R	IALPHA	001322R	IRATE	000714R	IRRG	000002R	002
IUTS = 000000R	IX	001324R	IY	001326R	MAXX	000004R	MINX	000002R	
NSR = 001334R	NSRX	001352R	NUM	= 000001	NUM1	= 000040	PC	= %000007	
NSR = 000000R	RUCUP	000474R	R0	= %000000	R1	= %000001	R2	= %000002	004
R3 = %000003	R4	= %000004	R5	= %000005	SP	= %000006	STARTX	000002R	002
STDPX = 000004R	TDLY1	000002R	TDLY2	000006R	TDLY3	000012R	XIII	000020R	
XLO = 000016R	X0	000012R	ZIN	000544R	ZNSC	001062R	ZOOM	000000RG	
ZOUT = 000232R									
. ABS. 000000									
DSPCOM 000022									
ATPARA 000014									
HTPCOH 000005									
IB.F 000004									

ERRORS DETECTED: 0

FREE CORE: 16676. WORDS

, BK1: Z00NKG/R: TTY/E: LC=Z00NKG

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Appendix G

KSCN3 Module Descriptions

The scanner control system (KSCN3) runs on the LSI-11 microcomputer and communicates with the PDP 11/45 and the scanner controller hardware. The system consists of six program modules which are described in this appendix.

KSCN3	- System driver
CM2	- Performs linear scan
CM4	- Performs X/Y scan
POINT	- Sends scanner to a point
WTPNT	- Waits for given point on scan axis
NCDR	- Takes encoder readings

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Module: KSCN3 - main program for KSCN3

Language: Macro-11

Entry Points: CM6, ERRSND, KENSCN

KENSCN - driver and initialization

External References: Commons

KENCOM - KSCN3 system common

Item	access	description
COMAND	r/w	Last command recieved from 11/45
CMDAT(9)	r/w	Command data
XPCOR(4)	ro	Correction factors
RID	wo	Outgoing packet ID for 11/45
SPEED	ro	Speed of scanner
STATUS	r/w	Status of current operation
RDY45	r/w	11/45 ready flag

External References: I/O Registers

address	access	description
300	wo	Reset button interrupt vector address
302	wo	Reset button interrupt status
334	wo	11/45 interrupt vector address (DR11 int. B)
336	wo	11/45 interrupt status
167740	r/w	CSR for DR11 to 11/45
167742	wo	Write register for DR11 to 11/45
167744	ro	Read register for DR11 to 11/45
167770	r/w	CSR for scanner controller interface
167772	wo	Write register for scanner controller
167774	ro	Read register from scanner Controller (status)

External References: Subroutines

name	description
CM2	Scans a line and pulses at intervals
CM4	Scans a plane area and pulses on grid points
NCDR	Gets encoder readings
POINT	Sends scanner to specified point

#### Functional Description:

When run from the console, KENSCN initializes common areas, enables interrupts and waits for first interrupt. When an interrupt from the 11/45 occurs, the command packet is accepted and subroutines are called to perform the requested scanner function. Currently supported commands are described in figures G-1 and G-2.

When the entry point CM6 is called as a subroutine, the current scanner status packet is sent to the 11/45. This is described in figure G-3.

When entry point ERRSND is called by a direct jump, the status is set to indicate an error condition and the status packet is sent to the 11/45. After the packet is sent, the program waits for the next interrupt.

When an interrupt from the remote control reset button occurs, a flag is set in KENCOM and a return from interrupt occurs.

Some 11/45 interrupts are completed by an RTI instruction and others are not. Commands which are not terminated with an RTI reset the stack pointer and cause previously active operations to be discarded. Normally terminated commands may be issued while other commands are in progress. However, this feature should be used with caution as anomolous operation

may result. Several of the commands are of such a nature that they never become the "active operation." The termination and activity status of each command is included in figure G-1.

#### Scan Commands

cmd.	term.	act.	description
0	none	X	Reset - stop scanner, reset KENSCN
1	none	X	Proceed to specified point
2	none	X	Scan line
3	RTI	X	Pulse and send encoder readings
4	none	X	Scan region in plane
5	RTI		Stop Scanner
6	RTI		Send status
7	RTI	X	Send encoder readings on reset
8	RTI		Pulse authorization (command 2 or 4 active)

Figure G-1

Module: CM2 - scan command two

Language: Macro-11

Called By: KSCN3, CM4

Calling Sequence: CALL CM2

External References: Commons

KENCOM - KSCN3 system common

Item	access	description
OUTDAT	wo	Outgoing packet to 11/45
XDIR	ro	X axis direction of movement 1/0 --> -/+
YDIR	ro	Y axis direction of movement
LPSA	ro	Last point seen on scan axis
STATUS	wo	Status of current operation
FPX	ro	X coordinate of 'from' point
FPY	ro	Y coordinate of 'from' point
TPX	r/w	X coordinate of 'to' point
TPY	r/w	Y coordinate of 'to' point
SCNAX	ro	Scan axis
INCR	ro	Scan increment
RDY45	ro	11/45 ready flag
OVRHNG	ro	Intentional overshoot factor

External References: I/O Registers

address	access	description
167772	wo	Write register for scanner controller
167774	ro	Read status register for scanner controller

External References: Subroutines

name	description
DELAY	Causes approximately 90 micro s. delay
ERRSND	Sends error status packet and waits
NCDR	Gets encoder readings
POINT	Sends scanner to a point
WTPNT	Waits for a point and pulses when there

Functional Description:

CM2 scans a line, pulsing and taking encoder readings at a fixed increment along the scan. If RDY45 has not been set and the scanner arrives at a point, a 'missed point' message is sent to the 11/45. Otherwise, the encoder readings are sent.

Module: CM4 - scan command 4

Language: Macro-11

Called By: KENSCN

Calling Sequence: CALL CM4

External References: Commons

KENCOM - KSCN3 system common

Item	access	description
CMDAT	ro	Command data
XDIR	ro	Direction of movement on X axis
YDIR	ro	Direction of movement on Y axis
STATUS	wo	Status of current operation
FPX	r/w	X coordinate of 'from' point
FPY	r/w	Y coordinate of 'from' point
TPX	r/w	X coordinate of 'to' point
SCNAX	wo	Scan axis
OVRHNG	ro	Intentional overshoot factor

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External References: I/O Registers

address	access	description
167772	wo	Write command register for scanner controller
167774	ro	Read status register for scanner controller

External References: Subroutines

name	description
CM2	Scans a line and pulses at intervals
CM6	Sends a status packet to the 11/45
DELAY	Causes a short delay for scanner controller command acceptance
ERRSND	Sets status to 'error' and sends status packet
POINT	Issues commands to send scanner to a point
WTPNT	Waits for a point and pulses when there

Functional Description:

CM4 performs an X/Y scan - pulsing at regular intervals in a grid. After each pulse, the encoders are read and sent to the 11/45. Two grids are provided: one is a normal grid where the rows of points are aligned in both axis directions and the other is a grid in which every other row is offset by half an increment. The offset grid is most commonly used by the primary ultrasonics task and the square grid is used by the transducer characterization system. At the end of each pass on the scan axis, an 'end of pass' status message is sent to the 11/45. Before each pulse, an authorization signal (command 8) must be received from the 11/45. If it is not received when the transducer is at a grid coordinate, a 'missed point' signal is sent to the 11/45 and no pulse occurs. A new pass is not begun until the first pulse authorization is received.

Module: POINT - routine to send scanner to a point

Language: Macro-11

Called By: CM2, CM4, KSCN3

Calling Sequence:

CALL POINT(XPNT,YPNT,SPEED,CORR,ERR)

Where:

XPNT is the X coordinate

YPNT is the Y coordinate

SPEED is the speed for both axes

CORR is a table of correction factors

CORR(1) - X axis, positive direction

CORR(2) - Y axis, positive direction

CORR(3) - X axis, negative direction

CORR(4) - Y axis, negative direction

ERR is an error flag, if set, point is out of range

note: Each element of CORR is that distance which will cause the scanner to move 1000(8) counts in the specified axis and direction.

External References: Commons

KENCOM - KSCN3 system common

Item	access	description
XLIM1	ro	X axis low limit
XLIM2	ro	X axis high limit
YLIM1	ro	Y axis low limit
YLIM2	ro	Y axis high limit
XDIR	wo	Direction of X axis motion 0/1
YDIR	wo	Direction of Y axis motion

External References: I/O Registers

address	access	description
167762	wo	Pulse counts register for scanner controller
167772	wo	Command register for scanner controller

Functional Description:

POINT issues the commands to the scanner controller to send the scanner to a given point. Return is immediate - POINT does not wait for command completion.

Module: WTPNT - waits for point and pulses

Language: Macro-11

Called By: CM2

Calling Sequence:

CALL WTPNT(AXIS,POINT,PLSFLG,ERROR)

where:

AXIS	is the scanning axis
POINT	is the point on the scan axis to be waited for
PLSFLG	is the pulse flag: if set, pulse is sent when at or past point.
ERROR	is set if scanner stops before desired point is seen.

External References: Commons

KENCOM - KSCN3 system common

Item	access	description
XDIR	ro	Direction of X axis motion 0/1
YDIR	ro	Direction of Y axis motion
LPSA	wo	Last point on scan axis
RDY45	r/w	11/45 ready flag

External References: I/O Registers

address	access	description
167764	ro	Encoder readings register
167772	wo	Scanner controller command register
167774	ro	Scanner controller axis motion status

Functional Description:

WTPNT waits for a given point on the scan axis and pulses when there if RDY45 has been set.

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Module: NCDR - sets encoder readings

Language: Macro-11

Called By: KSCN3, CM2

Calling Sequence: CALL NCDR

External References: Commons

KENCOM - KSCN3 system common

Item	access	description
RID	r/w	Record ID ( to 11/45)
OUTBUF	r/w	Outgoing data ( to 11/45)
LPSA	ro	Last point on scan axis

External References: I/O Registers

address	access	description
167764	ro	Encoder reading register
167772	r/w	Scanner controller command register

External References: Subroutines

name	description
DELAY	Produces short delay for command acceptance

Functional Description:

NCDR sets encoder readings from scanner controller and places them in common.

Appendix H

KSCN3 Common

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Common: KENCOM - KENSCN system common  
Accessed By: KSCN3, CH2, CH4, POINT, WTPNT, NCDR

off.	name	description
0	COMAND	Last command recieved from 11/45
2	CHDAT(9)	Command data
20	XPCOR	Positive X direction correction factor
22	YPCOR	Positive Y direction correction factor
24	XNCOR	Negative X direction correction factor
26	YNCOR	Negative Y direction correction factor
28	RID	Outgoing packet ID for 11/45
30	OUTDAT(10)	Outgoing packet to 11/45 Only 3 words used.
50	XLIN1	Encoder reading at low X limit of scanner
52	XLIN2	Encoder reading at high X limit of scanner
54	YLIN1	Encoder reading at low Y limit of scanner
56	YLIN2	Encoder reading at high Y limit of scanner
58	SPEED	Speed of scanner (both axis)
60	XDIR	Direction of X axis movement 1/0 --> -/+
62	YDIR	Direction of Y axis movement
64	LPSA	Last point seen on scan axis
66	ZLIN1	Encoder reading at low Z limit of scanner
68	ZLIN2	Encoder reading at high X limit of scanner
70	STATUP	Status of current operation: 0=done, 1=in progress, 2= , -1= error
72	FPX	X coordinate of 'from' point
74	FPY	Y coordinate of 'from' point
76	TPX	X coordinate of 'to' point
78	TPY	Y coordinate of 'to' point
80	SCNAX	Scan axis
82	INCR	Scan increment
84	MAXOVR	Maximum overshoot allowed
86	RDY45	11/45 ready flag
88	OVRHNG	Intentional overshoot factor

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**Appendix I**

**KSCN3 Module Listings**

```

1 1
2 2
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10 10
11 11
12 12
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54 54
55 55

000000

.TITLE KENSCN
.CLORL CM6,ERRSRD,KENSCN,DELAY,CM2,CM4,POINT,MCBR
.MCALL .RECDEF
11/45 INTERFACE ***
STATUS=167740,WRITE=167742, READ=167744
VECTOR=334/336(DATA IN)
SCANNER CONTROL INTERFACE ***
STATUS=167770, WRITE=167772, READ=167774
VECTOR=300/302(RESET BUTTON)
ENCODER D/A INTERFACE ***
WRITE=167762(COUNTS)
READ=167764(ENCODERS)
.RECDEF
.MACRO SAVE A
.IRPC B.A
MOV XB,-(SP)
.ENDM
.MACRO UNSAVE A
.IRPC B.A
MOV (SP)+,XB
.ENDM
.KENSCN:
CLR 167740
MOV 167770
P45INT,0334
CLR 0336
MOV RINT,0300
CLR 0302
CLR COMAND
CLR STATUS
40,0167740
100,0167770
100,0167772
18
BIC 167740
SAVE 0125
MOV COMAND+1,OLDCHD
JSR PC,GTCHD
ASL R0
JMP ECHDLST(R0)
CHDLST: .WORD
RESET,CHD1,CHD2,CHD3,CHD4,CHD5,CHD6,CHD7,CHD8

MOV 40,0167740
OLDCHD,04
18
STATUS
PC,CM6
1000,SP
MOV KENSCN
100,0167772
MOV 1,STATUS
MOV PC,DELAY
MOV 1000,SP
MOV PNTCAL,R5

;DISABLE INTERRUPTS
;SET VECTOR
;SET VECTOR
;ENABLE INTERRUPTS
;STOP SCANNER
;WAIT

;SAVE LAST COMMAND
;GET COMMAND AND DATA
;COMMAND 18 IN R0
ECHDLST(R0)
RESET,CHD1,CHD2,CHD3,CHD4,CHD5,CHD6,CHD7,CHD8

;ENABLE INTERRUPTS
;SEND COMMAND 4 FINISHED
;RESET STACK
;START OVER
;STOP SCANNER

```

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113	000640	105737	167740	28:	TSTB	00167740	;	WAIT FOR CLEAR
114	000644	002775			BLT	28		
115	000646	077117			SOB	R1, 38		
116	000650				UNSAVE	21		;
117	000654	052737	000040	167740	BIS	040, 00167740		ENABLE INTERRUPT
118	000652	000207	000106		RTS	PC		;
119	000654	005067			CLR	STATUS		SET ALL DONE
120	000670	000403			BR	SND2		;
121	000672	012767	177777	000106	MOV	-1, STATUS		SET ERROR
122	000700	004767	177650		JSR	PC, CM6		
123	000704	000777			BR	18		
124	000706	012701	000000		MOV	COMAND, R1		;
125	000712	113700	167744		MOV	00167744, R0		GET WORD COUNT
126	000716	005737	167740		TST	00167740		CHECK FOR INTERRUPT
127	000722	002375			BGE	18		;
128	000724	013721	167744		MOV	00167744, (R1)+		GET WORD
129	000730	052737	000001	167740	BIS	01, 00167740		ACKNOWLEDGE INTERRUPT
130	000736	005737	167740		TST	00167740		
131	000742	002775			BLT	28		
132	000744	042737			BIC	01, 00167740		
133	000752	077017			SOB	R0, 18		;
134	000754	116700	000001		MOV	COMAND+1, R0		GET COMAND IN R0
135	000760	000207			RTS	PC		RETURN TO KENSCH
136	000762	012703	000010		MOV	08, R3		WAIT A FEW CYCLES
137	000764	005703			TST	R3		
138	000770	077302			SOB	R3, 18		
139	000772				UNSAVE	3		
140	000774				PC			
141	000776	000207	167770		CLR	00167770		
142	001000	032737	000100	167772	BIT	0100, 00167772		
143	001004	001403			BEQ	18		
144	001012	012737	000004	167772	MOV	04, 00167772		
145	001014	052737	000000	167772	BIS	00, 00167772		ACCESS REGISTER TO KILL INTERRUPT
146	001022	005737	167770		TSTB	00167770		
147	001030	105737			BNI	18		
148	001034	100772			INC RSET			RESET BUTTON PRESSED
149	001036	005267	000010		MOV	0100, 00167770		
150	001042	012737	000100	167770	RTI	0		
151	001050	000002			.WORD	0		
152	001052	000000			.WORD	0		
153	001054	000000			.WORD	0		
154	001056	000000	000002	000004	OLD CMD:	5, CMDAT, CMDAT+2, SPEED, XPCOR, ERR		
155	001060	000003	000072	000024	PNTCAL:			
156	001066	000000			.CSECT KENCOM			
157	000000				INITIAL VALUE			ACCESS
158	000000				NAME			
159	000002				COMAND:			
160	000024	012000			CM DAT:			
161	000026	012000			XPCOR:			
162	000030	012000			YPCOR:			
163	000032	012000			YNCOR:			
164	000034	000000			RID:			
165	000036	000064			OUT DAT:			
166	000062	155600			XLIM1:			
167	000064	000000			XLIM2:			
168	000066	000000			YLIM1:			

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```

1  .TITLE CM2
2  .GLOBE CM6, POINT, ERRSND, CM2, NCDR, WTPNT, DELAY
3  .MCALL .REGDEF
4  .REGDEF
5  000000
6  ;CONAND TWO:
7
20 000000
21 000012 016702 000120'
22 000016 010267 000340
23 000022 006302
24 000024 016703 000122'
25 000030 005767 000126'
26 000034 001775
27 000036 016767 000114' 000340
28 000044 016767 000116' 000334
29 000052 026262 000110' 000114'
30 000050 101004
31 000062 066762 000130' 000404'
32 000070 000403
33 000072 166762 000130' 000404'
34 000100 012705 000370'
35 000104 005067 000300
36 000110 004767 000000G
37 000114 005767 000270
38 000120 001402
39 000122 000167
40 000126 016267 000110' 000230
41 000134 005762 000074'
42 000140 001401
43 000142 005403
44 000144 016201
45 000150 000402
46 000152 060367
47 000156 004767 000000G
48 000162 012705 000350'
49 000166 004767 000000G
50 000172 005767 000212
51 000176 031046
52 000200 000100' 000036'
53 000206 004767 000000G
54 000212 012767 000001 000106'
55 000220 005762 000074'
56 000224 001004
57 000226 020167 000132
58 000232 103430
59 000234 000403
60 000236 026701
61 000242 103424
62 000244 026762
63 000252 001737
64 000254 005737
65 000260 002415
66 000262 005762
67 000266 001405
68 000270 026762
69 000276 101325

;CM2:
SAVE
MOV 000120'
MOV 000340
ASL
MOV 000122'
TST 000126'
BEQ 68
MOV 000114'
MOV 000116'
CMP 000110'
BHI 000114'
ADD 000130'
BR 000404'
SUB 000130'
MOV 000370'
CLR 000300
JSR 0004767
TST 000270
BEQ 18
JMP 000000G
MOV 000110'
TST 000074'
BEQ 158
NEG 000114'
MOV 000206
ADD 000000G
JSR 0004767
MOV 000350'
JSR 0004767
TST 000212
BNE 000100'
MOV 000036'
JSR 0004767
MOV 000001 000106'
TST 000074'
BNE 000224
CMP 000132
BLO 000232
BR 000403
CMP 000236
BLO 000242
CMP 000244
BEQ 0001737
TST 167774
BLT 000074'
TST 0005762
BEQ 000070 000114'
BHI

;CONAND TWO:
;CM2:
01235
SCNAX, R2
R2, AXIS
R2
INCR, R3
RDY45
68
TPX, XPNT
TPY, YPNT
FPX(R2), TPX(R2)
78
OVRHNG, XPNT(R2)
58
OVRHNG, XPNT(R2)
PNTCAL, R5
ERR
PC, POINT
ERR
18
ERRSND
FPX(R2), PNT
XDIR(R2)
158
R3
TPX(R2), R1
38
R3, PNT
PC, NCDR
PNTCAL, R5
PC, WTPNT
ERR
OUT1
LPSA, OUTDAT(R2)
PC, CM6
PNT, STATUS
XDIR(R2)
48
R1, PNT
OUT1
58
PNT, R1
BLO
CMP
BLO
CMP
BR
CMP
BLO
000122
000114 000110'
58:
000114 000110'
58:
167774
000074'
0005762
000070 000114'
101325

;GET AXIS OF SCAN
;SCAN AXIS
;GET INCREMENT
;SEND MOVE COMMAND
;GET SCAN AXIS POINT
;CET DIRECTION OF SCAN
;NEGATE INCREMENT
;R1 IS MOST EXTREME ACCEPTABLE POINT
;GET ENCODER READINGS
;WAIT FOR POINT ON SCAN AXIS AND PULSE
;SEND ENCODER READINGS TO 11/45
;SET 'IN PROGRESS'. STATUS MAY HAVE BEEN SET TO 2
;CHECK SCAN DIRECTION
;IF BELOW EXTREME POINT RETURN
;IF ABOVE EXTREME, AND INCREASING, RETURN
;CHECK FOR COMPLETION
;CHECK FOR NEGATIVE DIRECTION
;CHECK FOR FINISHED

```

```

70 000300 000761
71 000302 026762
72 000310 163728
73 000312 000754
74 000314 000737
75 000320 002375
76 000322 012737
77 000330 004767
96 000334 000207
97 000346 000004
104 000350 000000
    000356 000366
105 000362 000000
106 000364 000000
107 000366 000001
108 000370 000005
    000376 000072
109 000404 000000
110 000406 000000
111 000410 000000
112 000000
113
114 000000
115 000002
116 000024
117 000026
118 000039
119 000032
120 000034
121 000036
122 000062
123 000064
124 000066
125 000070
126 000072
127 000074
128 000076
129 000100
130 000102
131 000104
132 000106
133
134 000110
135 000112
136 000114
137 000116
138 000120
139 000122
140 000124
141 000126
142 000130
143 000001

000056 000114 60
167774
000100 167772
000000C
70
000362 000364 WTCAL:
000410
AXIS:
PNT:
ONE:
PNTCAL:
000404 000406
000024 000410
XPNT:
YPNT:
ERR:
; NAME INITIAL VALUE
; COMMAND:
; CMDAT:
; XPCOR:
; YPCOR:
; XNCOR:
; YNCOR:
; RID:
; OUTDAT:
; XLIM1:
; XLIM2:
; YLIM1:
; YLIM2:
; SPEED:
; XDIR:
; YDIR:
; LPSA:
; ZLIM1:
; ZLIM2:
; STATUS:
; FPX:
; FPY:
; TPX:
; TPY:
; SCNAX:
; INCR:
; MAXOVR:
; RBY45:
; OVRHNC:
; END

50 PNT,TPX(R2) ;CHECK FOR END OF PASS
20 ;WAIT FOR SCANNER TO STOP
50 167774
OUT1
MOV 100,0167772 ;STOP SCANNER
PC,DELAY
JSR 53210
UNSAVE
RTS PC
4,AXIS,PNT,ONE,ERR
.WORD 0
.WORD 0
.WORD 1
5,XPNT,YPNT,SPEED,XPCOR,ERR
.WORD 0
.WORD 0
.WORD 0
.CSECT KENCOM
; LAST COMMAND RECEIVED
; COMMAND DATA
; +X DIRECTION CORRECTION
; +Y CORRECTION
; -X CORRECTION
; -Y CORRECTION
; OUTGOING RECORD ID TO 11/45
; OUTGOING DATA
; LIMITS OF PHYSICAL SCANNER
; IN ACTUAL SCANNER READINGS
; SPEED 0 FSCANNER
; DIRECTION OF X AXIS MOVEMENT 1/0
; DIRECTION OF Y AXIS MOVEMENT 1/0
; LAST POINT SEEN ON SCAN AXIS
; STATUS OF CURRENT OPERATION
; 0=ALL DONE, 1= UNDER WAY, -1=ERROR
; FROM POINT X
; FROM POINT Y
; TO POINT X
; TO POINT Y
; SCAN AXIS
; INCREMENT
; MAXIMUM OVERSHOOT ALLOWED

```

SYMBOL TABLE

AXIS	000362R	002	CHDAT	000002R	002	CM2	000000RC	002	CM21	000104R	002	CM6	000110R	002
COHAND	000000R	002	DELAY =	***** G	002	ERR	000410R	002	ERRSND=	***** G	002	FPX	000110R	002
FPY	000112R	002	INCR	000122R	002	LPSA	000100R	002	MAXOVR	000124R	002	MCDR	0000007	002
ONE	000366R	002	OUTDAT	000036R	002	OUT1	000314R	002	OVRHNG	000130R	002	PC	000034R	002
PNT	000364R	002	PNTCAL	000370R	002	POINT =	***** G	002	RDY45	000126R	002	RID	0000004	002
R0	0000000	002	R1	0000001	002	R2	0000002	002	R3	0000003	002	R4	0000004	002
R5	0000005	002	SCHAX	000120R	002	SP	0000006	002	SPEED	000072R	002	STATUS	000106R	002
TPX	000114R	002	TPY	000116R	002	WTCAL	000350R	002	WTPNT =	***** G	002	XD1R	000074R	002
XL1M1	000062R	002	XL1M2	000064R	002	XMCOR	000030R	002	XPCOR	000024R	002	XPNT	000404R	002
YD1R	000076R	002	YL1M1	000066R	002	YL1M2	000070R	002	YNCOR	000032R	002	YPCOR	000026R	002
YPNT	000406R	002	ZL1M1	000102R	002	ZL1M2	000104R	002						
. AHS.	0000000	000												
KENCOM	000132	001												
ERRORS DETECTED:	0	002												
FREE CORE:	18165. WORDS													

.DK1:CH2/N:TTH/E:LC=CM2



```

50
59 000212 074300
60 000214 016061 000002' 000114'
61 000222 013705 000014'
62 000226 006205
63 000230 026161 000114' 000110'
64 000236 010095
65 000240 005767
66 000244 001402
67 000246 000561
68 000252 004767
69 000256 006762
70 000264 016767
71 000272 016767
72
73 000300 005761
74 000304 001004
75 000306 006761
76 000314 000403
77 000316 166761
78 000324 026262
79 000332 101050
80 000334 012705
81 000340 004767
82 000344 077503
83 000346 012705
84 000352 004767
85 000356 016767
86 000364 016767
87 000372 012767
88 000400 004767
89 000404 012767
90 000412 012705
91 000416 004767
92 000422 077503
93 000424 005737
94 000430 002375
95 000432 012705
96 000436 004767
97 000442 077503
98 000444 052737
99 000452 000652
100 000454
101 000456 000207
102 000470 000000
103 000472 000000
104 000474 000005
105 000502 000072
106 000510 000000
107
108 000000 000000
109 000002 012000
110 000024 012000
111 000026 012000
112 000030 012000
113 000032 012000

; SNAP DIRECTIONS
CMDAT(R0),TPX(R1) ;GET SCAN POINT
R5 ;GET INCREMENT
CMDAT+12,R5 ;DIVIDE BY 2
TPX(R1),FPX(R1)
28
28 CMDAT+12. ;CHECK FOR OFFSET SCAN
R5,FPX(R1) ;ADD HALF AN INCREMENT TO OFFSET SCAN
PC,CM2 ;SCAN LINE
CMDAT+12,TPX(R2) ;INCREMENT NO SCAN AXIS
TPX,XPNT
TPY,YPNT
;GET OLD 'TO' POINT ONSCAN AXIS
;FOR NEW 'FROM' POINT
;CHECK DIRECTION OF SCAN
;ADD OVERHANG TO DRIVE PAST POINT

XDIR(R1)
38
OVRNG,XPNT(R1)
48
OVRNG,XPNT(R1)
TPX(R2),CMDAT+4(R2) ;CHECK FOR END
CM4OUT ;IF PAST H1, EXIT
;3000.,R5
PC,DELAY
R5,58 ;WAIT
;PNTCAL,R5
PC,POINT
TPX,FPX ;MOVE FOR NEXT PASS
TPY,FPY
;3,STATUS
PC,CM6
;1,STATUS
;200.,R5
PC,DELAY
R5,78
R5,167774 ;WAIT FOR COMPLETION
88
;300.,R5
PC,DELAY
R5,98
;100.,0167772 ;STOP SCANNER
CM42
53210 PC
XPNT: .WORD 0
YPNT: .WORD 0
PNTCAL: .WORD 0
ERR:
; NAME INITIAL VALUE DESCRIPTION ACCESS
; COMMAND: .WORD 0 ;LAST COMMAND RECEIVED
; CMDAT: .BLKW 9 ;COMMAND DATA
; XPCOR: .WORD 12000 ;+X DIRECTION CORRECTION
; YPCOR: .WORD 12000 ;+Y CORRECTION
; XNCOR: .WORD 12000 ;+X CORRECTION
; YNCOR: .WORD 12000 ;+Y CORRECTION

```

```

114 000034 000000
115 000036
116 000062 000000
117 000064 120000
118 000066 000030
119 000070 076000
120 000072 000000
121 000074 000000
122 000076 000000
123 000100 000000
124 000102 000000
125 000104 000000
126 000106 000000
127
128 000110 000000
129 000112 000000
130 000114 000000
131 000116 000000
132 000120 000000
133 000122 000000
134
135 000130 000400
136 000001

```

RID: .WORD 0  
 OUTDAT: .BLKW 10.  
 XLIM1: .WORD 60  
 XLIM2: .WORD 120000  
 YLIM1: .WORD 50  
 YLIM2: .WORD 76000  
 SPEED: .WORD 0  
 XDIR: .WORD 0  
 YDIR: .WORD 0  
 LSPA: .WORD 0  
 ZLIM1: .WORD 0  
 ZLIM2: .WORD 0  
 STATUS: .WORD 0  
 FTX: .WORD 0  
 FPY: .WORD 0  
 TPX: .WORD 0  
 TPY: .WORD 0  
 SCHAX: .WORD 0  
 INCR: .WORD 0  
 OVRUNG: .BLKW 2  
 .END 400

;OUTGOING RECORD ID TO 11/45  
 ;OUTGOING DATA  
 ;LIMITS OF PHYSICAL SCANNER  
 ;IN ACTUAL SCANNER READINGS  
 ;SPEED 0 FSCANNER  
 ;DIRECTION OF X AXIS MOVEMENT 1/0  
 ;DIRECTION OF Y AXIS MOVEMENT 1/0  
 ;LAST POINT SEEN ON SCAN AXIS  
 ;STATUS OF CURRENT OPERATION  
 ;0=ALL DONE, 1= UNDER WAY, -1=ERROR  
 ;FROM POINT X  
 ;FROM POINT Y  
 ;TO POINT X  
 ;TO POINT Y  
 ;SCAN AXIS  
 ;INCREMENT

```

CM4 SYNTAX TAB
CM4DAT 000002R 002 CM2 = ***** G
CM6 = ***** G
FPX 000110R 002 CM2 COHAND 000000R 002
OVRNG 000130R 002 FTY 000112R 002
R0 =X000000 002 PC =X000007 002
R3 =X000000 002 R1 =X000001 002
TPX 000114R 002 SCMAX 000120R 002
XLIN2 000064R 002 TTY 000116R 002
YLINI 000066R 002 XMCOR 000030R 002
ZLINI 000102R 002 YLIN2 000070R 002
. ABS. 000000 002 ZLIN2 000104R 002
KONCON 000132 001
ERUONS DETECTED: 0
FREE CORE: 10101. WORDS

```

.DK1:CM4/N:TTN/E:LC=CM4

```

CM4 000000NC 002
CM4 DELAY = ***** G 002
INCR 000122R 002
PNTCAL 000474R 002
R2 =X000002 002
SP =X000006 002
VPNT = ***** G 002
XPCOR 000024R 002
YPCOR 000032R 002

```

```

CM4OUT 000454R 002
ERR 00010R 002
LSPA 000100R 002
POINT = ***** G 002
R3 =X000003 002
SPEED 000072R 002
XDIR 000074R 002
XPNT 000470R 002
YPCOR 000026R 002

```

```

CM42 000200R 002
ENRSD- ***** G 002
OUTDAT 000036R 002
R1B 000034R 002
R4 =X000004 002
STATUS 000106R 002
XLINI 000062R 002
YDIR 000076R 002
YPNT 000472R 002

```

```

1  .TITLE POINT
2  .GLOBAL DELAY,POINT
3  .MACRO
4  .RECEIVE
5  000000
6
19 000000
20 000012 052737 000100 167772
21 000020 005075 000012
22 000024 017503 000002
23 000030 020367 000064
24 000034 101121
25 000036 020367 000062
26 000042 103516
27 000044 010367 000260
28 000050 017503 000004
29 000054 020367 000070
30 000060 101107
31 000062 020367 000066
32 000066 103504
33 000070 010367 000236
34 000074 017503 000006
35 000100 072327 000011
36 000104 052703 000020
37 000110 010337 167772
38 000114 005203
39 000116 004767 000000C
40 000122 010337 167772
41 000126 004767 000000C
42 000132 005003
43 000134 005001
44 000136 010304
45 000140 012737
46 000146 050237 167772
47 000152 004767 000000C
48 000156 016301 000330
49 000162 003063 000074
50 000166 163701 167764
51 000172 103007
52 000174 005401
53 000176 005263 000074
54 000202 062704 000004
55 000206 052702 000400
56 000212 052702 000050
57 000216 062701 000004
58 000222 066504 000010
59 000226 005000
60 000230 073027 000011
61 000234 071014
62 000236 010037 167762
63 000242 010237 167772
64 000246 004767 000000C
65 000252 052737 000200 167772
66 000260 004767 000000C
67 000264 005703
68 000266 001007
69 000270 005723

```

POINT: 167772  
 P1: 167772  
 18: 167772

```

SUBROUTINE IT ISSUE COMANDS TO GO TO A SPECIFIED POINT
SAVE 01234
BIS 100,0/167772 ;STOP SCANNER
CLA 012(R3)
MOV 02(R3),R3 ;SET X POINT
CMP R3,XL1R2 ;CHECK AGAINST LIMITS
BHI ERRUT ;IF OUTSIDE, ERROR RETURN
CMP R3,XL1R1
BLO ERRUT
MOV R3,XPRT ;STORE X POINT
MOV 04(R5),R3 ;SET Y POINT
CMP R3,YL1R2 ;CHECK AGAINST LIMITS
BHI ERRUT ;IF OUTSIDE, ERROR RETURN
CMP R3,YL1R1
BLO ERRUT
MOV R3,YPRT ;STORE Y POINT
MOV 06(R5),R3 ;SET SPEED
ASL 09,R3 ;SHIFT TO PLACE IN WORD
BIS 20,R3 ;OR IN COMMAND
MOV R3,0/167772 ;LOAD SPEED,X
INC R3
JSR PC,DELAY ;LOAD SPEED,Y
MOV R3,0/167772
JSR PC,DELAY
CLR R3
CLR R2
R3,R4 ;R4 POINTS TO CORRECTIONS
MOV 04,0/167772 ;SELECT AXIS
BIS R2,0/167772
JSR PC,DELAY
MOV XPRT(R3),R1 ;SET ENCODER READINGS
CLR XD1R(R3) ;SET DISTANCE TO POINT
SUB 0/167764,R1 ;IF POSITIVE
BHS 18 ;NEGATE DISTANCE
NEG R1
XD1R(R3) ;POINT TO NEGATIVE CORRECTIONS
ADD 04,R4 ;REVERSE DIRECTION
BIS 00,R2 ;SET COMMAND INTO R2
ADD 04,R1 ;ADD ADDRESS OF CORRECTIONS
CLR R0
R0,R0 ;DIVIDE BY CORRECTION
MOV R0,0/167762 ;SET COUNTS
MOV R2,0/167772 ;SET COMMAND
JSR PC,DELAY
BIS 200,0/167772
JSR PC,DELAY ;CHECK FOR SECOND AXIS
R3 OUT ;INCREMENT
TST (R3)+

```

70	000272	012702	000001	NDV	1.R2	SET UP R2 FOR Y AXIS
71	000276	000717		BR	P1	GO FOR Y AXIS
72	000300	012775	000001	NDV	1.012(R3)	SET ERROR
73	000306	012737	000005	NDV	5.0167772	SELECT NONEXISTANT AXIS
74	000314			UNSAVE	43210	
75	000326	000207		RTS	PC	
76	000330	000000		WORD	0	X POINT
77	000332	000000		WORD	0	Y POINT
78	000000	000000		SELECT	KEKCON	
79				BLKV	25	
80	000062	000064		WORD	64	
81	000064	155601		WORD	155601	
82	000066	000000		WORD	0	
83	000070	115117		WORD	115117	
84				BLKV	1	
85	000074			BLKV	2	
86		000001		END		

SYMBOL TABLE

DELAY = ***** C	ERROUT 000300R	OUT	000306R	PC	-X000007	POINT	000000RG
P1 000136R	R0 =X000000	R1	=X000001	R2	=X000002	R3	=X000003
R4 =X000004	R5 =X000005	SP	=X000006	XDIR	000074R	XLIM1	000062R
XLIM2 000064R	002 XPNT 000330R	YLIM1	000066R	YLIM2	000070R	YPNT	000332R
. ABS. 000000	000						
KENCON 000334	001						
000100	002						
ERRORS DETECTED: 0							
FREE CORE: 16349. WORDS							
.DK1:POINT/N-TTM/E:LC=POINT							



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SYMBOL TABLE

CMDAT	0000002R	002	COMAND	0000000R	002	DEC11	000166R	002	DELAY = ***** C	002	LPSA	000100R
OUT	000124R		OUT1	000166R		OUT2	000140R		OUT3	000156R	PC	=X0000007
RDY45	000126R	002	R0	=X0000000		R1	=X0000001		R2	=X0000002	R3	=X0000003
R4	=X0000004		R5	=X0000005		SP	=X0000006		STATUS	000106R	WTPNT	0000000RC
XD1R	000074R	002	YD1R	000076R	002							
. ABS.	000000	000										
	000176	001										
KENCOH	000130	002										
ERRORS DETECTED:	0											
FREE CORE:	18329. WORDS											

.DK1:WTPNT/N:TTM/E:LC-WTPNT

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Appendix J

DIND Module descriptions

DIND consists of four program modules:

CSICAL	Inputs command string and opens files
DIND	Data indexing driver
SCANDI	Expands compressed signal data
WIR	Writes index records to disk

These are described in the following pages.

Module: DIND - data indexing driver

Language: Macro - 11

Run Sequence:

.R DIND

\*DDD:NNNNNN.XXX=DDD:NNNNNN.XXX

where:

DDD is a device (default is DK0)  
NNNNNN is a file name (no default)  
XXX is an extension  
(default is .IND for output, .DAT for input)

External References: Commons

INDCOM - index common

Item	access	description
DSTAT	r/w	Data status #0--> No more data
CBLK	wo	Block number in data file
DBPTR	wo	Pointer into OUTBUF
ICHNUM	ro	Index channel number
DCHNUM	ro	Data channel number
IH(256)	ro	Index header

External References: Subroutines

Name	description
CSICAL	Gets command strings and opens files
SCAND	Reads data file and expands recorded data
WIR	Writes index records to index file

External References: Files/LUNS

LUN	actions	description
WCHNUM	W,C	Index file
RCHNUM	C	Data file

Functional Description:

DIND first prompts the user for a command string giving the two files to be used in the index processing. An index file is produced for use in accessing the given data file. This file consists of an index header block and several index blocks. The format of these is shown in tables D-1 and D-2 below.

Table D-1

Index Header Block

FB(4)	Four word file descriptor for data file
NORP	Number of recorded points
NIB	Number of index blocks
XLIM1	Limits of scan
YLIM1	
XLIM2	
YLIM2	
ZPNT	Z coordinate of scan
TDLY	Total trigger delay
IUTS	Sample rate units
IRNG	Sample rate range
INCR	Scan increment
OF	Offset scan flag
XDCRID(6)	6 Byte transducer ID
SMPLID(18)	18 byte sample ID
IBLIM(5,45)	45 element index of index
X1	X of 1st point in index block
Y1	Y of 1st point in index block
X2	X of last point in index block
Y2	Y of last point in index block
XDIR1,XDIR2	Direction of X movement at top and bottom of index block.

\*See ATPARA Description

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Table D-2

Index Block Format

X	X coordinate
Y	Y coordinate
DBLK	Block number
OFFSET	Offset in block

There are 64. point records per index block.

Module: CSICAL - calls Command String Interpreter.

Language: Macro-11

Called By: DIND

Calling Sequence: CALL CSICAL.

External References: Commons

INDCOM - index common

Item	access	description
ICHNUM	ro	Index channel number
DCHNUM	ro	Read channel number
FB	wo	File descriptor block for data file

External References: Files/LUNS

LUN	actions	description
WCHNUM	0	Index file
RCHNUM	0	Data file

Functional Description:

CSICAL prompts the user for a command string, fetches the required handlers and opens the data and index files requested by the command string. Any file errors are reported on the console. The data file descriptor block is saved in the index header area.

Module: SCANDI - reads the data file and expands data

Language: Macro-11

Called By: DIND

Calling Sequence: CALL SCAND

External References: Commons

INDCOM - index common

Item	access	description
DSTAT	wo	Data status: 1=no more data
STARTX	r/w	Low x value of recorded data
STOPX	r/w	End of recorded data in IBUF
XPNT	wo	X coordinate of point
YPNT	wo	Y coordinate of point
CBLK	r/w	Block number for data file
DBPNTR	r/w	Pointer into OUTBUF
OBPNT1	wo	Offset at start of expansion
OBLKN	wo	Block number at start of expansion
DCHNUM	ro	Read channel number
TWOFFS	wo	Time window offset
XLIM1	wo	Limits of recorded scan
YLIM1	wo	
XLIM2	wo	
YLIM2	wo	
ZPNT	wo	Z coordinate of scan
TDLY	wo	Total trigger delay
IUTS*	wo	Data rate units
IRNG	wo	Transducer identification
IBUF	wo	Expanded data buffer
OUTBUF	r/w	Compressed data buffer

\*See ATPARA description for format

External References: Files/LUNS

LUN	actions	description
RCHNUM	r	Data file

Functional Description:

SCANDI expands data at indicated block and offset into IBUF. See descriptions of RECOR and SCAND for details of compressed data format.

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Module: WIR - writes index records to disk

Language: Macro - 11

Called By: DIND

Calling Sequence: CALL WIR

External References: Commons

INDCOM - index common

Item	access	description
DSTAT	ro	Data status - 1=last point
XPNT	ro	X coordinate of point
YPNT	ro	Y coordinate
OBPNT1	ro	Block number of start of point in data
OBLKN	ro	Offset of start of point in block
ICHNUM	ro	Index file channel number
NORP	r/w	Number of recorded points
NIB	r/w	Number of index blocks
IBLIN	wo	Index of index blocks
IRS	wo	Index block buffer

External References: Files/LUNS

LUN	actions	description
WCHNUM	w	Index file

Functional Description:

WIR writes point records to the index file. The IRS buffer is written to disk when it is filled or when DSTAT is non-zero on entry to WIR. If disk errors are detected they are reported on the system console and the program exits.

# Appendix K

## DIND Common Description

The Data Indexing system contains one common area.

Common: INDCOM - index common

Accessed By: CSICAL, DIND, SCANDI, WIR

offset	name	Description
0	DSTAT	Data status: 0=more data remaining, 1=end of data
2	STARTX	Low X value of data to be processed
4	STOPX	High X value of data to be processed
6	XPNT	Current X coordinate
8	YPNT	Current Y coordinate
10	CBLK	Current block number in data file
12	DBPNTR	Data buffer pointer
14	OBPNTR	Old DBPNTR
16	OBLKN	Old block number
18	ICHNUM	Index channel number
20	DCHNUM	Data channel number
22	Spares(5)	
32	IH(256)	Index header block ( includes next 256 words)
32	FB(4)	Fileblock for data file
40	NORP	Number of recorded points
42	NIB	Number of index blocks
44	Spares(3)	
50	XLIM1	Low X limit of scan
52	YLIM1	Low Y limit of scan
54	XLIM2	High X limit of scan
56	YLIM2	High Y limit of scan
58	ZPNT	Z coordinate of scan
60	TDLY	Total trigger delay
62	IUTS	Sample rate units
64	IRNG	Sample rate range
66	INCR	Scan increment
68	OF	Offset scan flag
70	XDCRID(6)	ASCII transducer identification
76	SNPLID(18)	ASCII ball description
94	IBLIN95,45)	45 element index of index
544	IRS(256)	Index record buffer
1056	IBUF(2048)	Expanded data buffer (bytes)
3104	OUTBUF(2048)	Compressed data buffer (bytes)

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**Appendix L**

**DIND Module Listings**

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```

1 2
3 4 000000
5 5 000000
6 6 000000
7 7 000002
8 8 000014
9 9 000026
10 10 000032
11 11 000046
12 12 000050
13 13 000052
14 14 000056
15 15 000070
16 16 000072
17 17 000074
18 18 000104
19 19 000106
20 20 000114
21 21 000116
22 22 000154
23 23 000156
24 24 000164
25 25 000166
26 26 000220
27 27 000222
28 28 000230
29 29 000232
30 30 000240
31 31 000246
32 32 000254
33 33 000262
34 34 000264
35 35 000266
36 36 000271
37 37 000274
38 38 000277
39 39 000301
40 40 000304
41 41 000307
42 42 000312
43 43 000315
44 44 000320
45 45 000321
46 46 000324
47 47 000327
48 48 000332
49 49 000335
50 50 000340
51 51 000342
52 52 000344
53 53 000346
54 54 000350
55 55 000366
56 56 000000
57 57 000000

010667 000232
103001
000000
016706 000206
103406
010002
103004
000731
103004
000705
103004
000663
016767
000144 000042
016767 000140 000044
000134 000046
000939
101 104
104 105
111 103
030
116
101 104
124 040
120 105
030 105
114 105
111 114
040 116
124 040
117 125
104 030
014424
035164
035164
035164
035164
000000
000000

CSICAL: .RCTRLO ICHNUH
          .CLOSE DCHNUH
          .MOV SP,SPSAV
          .CSISPC #FLS,#DFBLK
          BCC 33
          HALT
          .MOV SPSAV,SP
          .FETCH @#50,#FLS
          BCS FERR
          .MOV R3,R2
          .FETCH R2,#FLS+30
          BCC RFERR
          .PRINT #MSG1
          BR CSICAL
          .ENTER #AREA,ICHNUH,#FLS
          BCC 13
          .PRINT #MSG2
          BR CSICAL
          .LOOKUP #AREA,DCHNUH,#FLS+30
          BCC 33
          .PRINT #MSG3
          BR CSICAL
          .MOV FLS+30.,FB
          .MOV FLS+32.,FB+2
          .MOV FLS+34.,FB+4
          .MOV FLS+36.,FB+6
          RTS PC
          .WORD 0
          .ASCIZ /BAD DEVICE/

          .ASCIZ /CAN'T OPEN FILE/

          .ASCIZ /FILE NOT FOUND/

          .RAD50 /DAT/
          .RAD50 /IND/
          .RAD50 /IND/
          .RAD50 /IND/
          .BLKW 39
          .BLKW 5
          .CSECT INDCOM
          .WORD 0

          .DSTAT: .DATA STATUS: 0= MORE DATA. 1= END OF DATA.

```

```

46 000002 000000 STARTX: .WORD 0
47 000004 000000 STGPX: .WORD 0
48 000006 000000 XPNT: .WORD 0
49 000010 000000 YPNT: .WORD 0
50 000012 000000 CELG: .WORD 0
51 000014 000000 DEPNTR: .WORD 0
52 000016 000000 DEPNTR1: .WORD 0
53 000020 000000 GELKH: .WORD 0
54 000022 000001 ICHROH: .WORD 1
55 000024 000002 BCNRUN: .WORD 2
56 .BLKW .BLKW 5.
57 000040 IR: .BLKW 4
58 000040 FB: .BLKW 4
59 000050 NCRP: .WORD 0
60 000052 NIB: .WORD 0
61 .BLKW .BLKW 3
62 000062 XLH1: .WORD 0
63 000064 YLH1: .WORD 0
64 000066 XLH2: .WORD 0
65 000070 YLH2: .WORD 0
66 000072 ZPNT: .WORD 0
67 000074 TELY: .WORD 0
68 000076 IUTS: .WORD 0
69 000100 INRC: .WORD 0
70 000102 INCR: .WORD 0
71 000104 OF: .WORD 0
72 000106 XCRID: .BLKW 6
73 000114 SEMPLD: .BLKW 13.
74 000135 IBLTH: .BLKW 225.
75 000140 IFS: .BLKW 256.
76 000240 IBUF: .BLKW 2043.
77 000040 OUTBUF: .BLKW 2043.
78 000001 .END

```

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AREA	000466R	CBLK	000012R	002	CSICAL	000000R	002	DBPTR	000014R	002	DCHNUM	000024R	002
DFBLK	000340R	DSTAT	000000R	002	FB	000040R	002	FERR	000106R	002	FLS	000350R	002
IBLH	000136R	IBUF	002040R	002	ICHNUM	000022R	002	IH	000040R	002	INCR	000102R	002
IRRG	000100R	IRS	001040R	002	IUTS	000076R	002	MSG1	000266R	002	MSC2	000301R	002
MSC1	000321R	MFERR	000116R	002	NIB	000052R	002	NORP	000050R	002	OBLKN	000020R	002
OBPTI	000016R	OF	000104R	002	OUTBUF	000040R	002	PC	=%000007	002	R0	=%000000	002
R1	=%000001	R2	=%000002	002	R3	=%000003	002	R4	=%000004	002	R5	=%000005	002
SIMPLD	000114R	SP	=%000006	002	SPSAV	000264R	002	STARTX	000002R	002	STOPX	000004R	002
TDLY	000074R	XDCRID	000106R	002	XLIMI	000062R	002	XLIN2	000066R	002	XPNT	000006R	002
YLIMI	000064R	YLINE2	000070R	002	YPNT	000010R	002	ZPNT	000072R	002	...V2	= 000001	002

. ABS. 000000 000  
INDCOH 000500 001  
INDCOH 012040 002  
ERRORS DETECTED: 0  
FREE CORE: 16280. WORDS

, BK1:CSICAL/N:TTW/E:LC=CSICAL

[illegible]

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1  .TITLE DIND
2  .MCALL .SRESET, .CLOSE, .RECDEF, .V2, .EXIT, .PRINT, .WRITE
3  .GLOBL DIND, CSICAL, SCAND, WIR
4  .V2...
5  .RECDEF
6  MOV #DSTAT, R0 ; CLEAR INDCOM
7  MOV #272, R1
8  CLR (R0)+
9  SOB R1, L3
10 .SRESET
11 CLR CBLK
12 CLR DBPWTR
13 MOV #1, ICHNUM
14 MOV #2, DCHNUM
15 END OF INITIALIZATION
16 JSR PC, CSICAL
17 JSR PC, SCAND
18 JSR PC, WIR
19 TST DSTAT
20 BEQ D4
21 MOV #10, R0
22 RCC OUT ; OPEN FILES
23 SOB R0, L3 ; READ DATA
24 .PRINT #MSG1 ; WRITE INDEX RECORD
25 .EXIT ; CHECK FOR EOF
26 .CLOSE ; IF NOT, GET NEXT RECORD.
27 .CLOSE ICHNUM ; WRITE INDEX HEADER.
28 BR DIND ; AREA, ICHNUM, #1H, #256, #0
29 .BLKW 5 ; IF FAIL, TRY 10 TIMES.
30 .ASCIZ /FAILED ON TEN ATTEMPTS TO WRITE INDEX HEADER/
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**L-6**





```

56 000242 077102      SOB      R1,SC1      ;GO AGAIN
57 000244 000731      BR       SC
58 000246 000203      IRC       ;UP ONE
59 000250 110324      MOV      R3,(R4)+    ;INSERT VALUE
60 000252 077102      SOB      R1,R3      ;GO AGAIN
61 000254 000735      BR       SC
62 000256 000303      DEC       R3         ;DOWN ONE
63 000260 110324      MOV      R3,(R4)+    ;INSERT VALUE
64 000262 077102      SOB      R1,R3      ;GO AGAIN
65 000264 000731      BR       SC
66 000266 000103      ADD       R1,R3      ;UP COUNT
67 000270 110324      MOV      R3,(R4)+    ;INSERT VALUE
68 000272 000726      BR       SC
69 000274 160103      SUB       R1,R3      ;DOWN COUNT
70 000276 110324      MOV      R3,(R4)+    ;INSERT VALUE
71 000300 000723      BR       SC
72 000302
73 000302 012700      MOV      #BUF+2043.,R0;GET END OF BUFFER
74 000302 006040      SUB       R4,R0      ;COMPUTE NUMBER OF VALUES
75 000306 160400      BLE       35
76 000310 003497      CLC
77 000312 000241      ROR
78 000314 006000      BLE
79 000316 003404      BCC
80 000320 103001      CLRB
81 000322 105024      CLR       (R4)+
82 000324 005024      CLR       (R4)+
83 000326 077002      SOB      R9,R13     ;CLEAR WORD
84 000330 032702      BIT       #1,R2     ;GO AGAIN
85 000336 005302      DEC       23        ;CHECK ODD ADDRESS
86 000340 001627      MOV      R2,DBPNTR  ;IF NOT,SKIP
87 000344 000167      JMP       OUT      ;SKIP ONE BYTE BACK (FOR IS 1 BYTE IF ODD ADDRESS)
88 000350
89 000354 000410      BR       R01
90 000356 020227      NEWDAT: CHIP R2,#OUTBUF+2048. ;CHECK FOR END OF BUFFER
91 000362 103505      BLO
92 000364 062767      ADD       #4,CBLK      ;IF NOT, RETURN
93 000370 000012      HD1:
94 000376 103044      BCC      #AREA,DCHRUH,#OUTBUF,#1024.,CBLK ;INCREMENT BLOCK NUMBER
95 000446 105737      BEQ      #52      ;IF NO ERROR ON READ GO TO RD4
96 000450 001433      .RCTL0    ;FIND OUT WHICH ERROR
97 000454 000456      .PRINT   #FSC1    ;IF ZERO, EOF
98 000460 000466      .EXIT     ;WRITE MESSAGE ON CONSOLE
99 000470 000470      .CHTGT    ;ADD EXIT
100 000530 000      FSC1:
101 000532 005700      AREA:      ;CHANNEL ERROR ON READ - EXITING, 1
102 000534 001604      BNE
103 000536 000006      ADD
104 000540 177302      JHP
105 000544 000014' ND4:
106 000546 012767      MOV      #OUTBUF,DBPNTR ;SKIP SAVED REGISTERS AND SAVED ADDRESS
107 000550 016702      UNSAVE  50      ;RETURN TO MRS
108 000552 000014'      MOV      DBPNTR,R2  ;RESET TO TOP OF BUFFER
109 000554 000014'      UNSAVE  50      ;GET NEW POINTER

```



SCAND1 RT-11 MACRO VHS2-12 21-NOV-79 PAGE 1+

166 006030  
167

000001'

OUTBUF: .BLKB  
.END

204B.

;COMPRESSED DATA BUFFER

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AREA	00000000	000012R	002	DBPTR	000014R	002	DCHNUM	000024R	002	DSTAT	000000K	002
EDFOW	000024R	000040R	002	IBLH	000136R	002	IEUF	002040R	002	ICHNUM	000022R	002
IN	000040R	000102R	002	IRGC	000100R	002	IES	001040R	002	IUTS	000076R	002
NEG1	000020R	000350R	002	NIB	000052R	002	RORP	000050R	002	OBLKN	000020R	002
ORPRT1	000016R	000104R	002	OUT	000304R	002	OUTBUF	000040R	002	PC	=%000097	002
R0	=%000000	R1 =%000001		R2	=%000002		R3 =%000003			R4 =%000004		
R5	=%000005	SNPLID	000114R	002	SP	=%000006	STARTX	000002R	002	STOPX	000004R	002
TDLY	000074R	WIR	000000RG	002	WR	000104R	SDCRID	000106R	002	XLIM1	000052R	002
XLIM2	000066R	XPNT	000006R	002	YLIM1	000064R	YLINE2	000070R	002	YPNT	000010R	002
ZPNT	000072R	...V2 = 000001										
. ABS.	000000											
INCOH	012040											
ERRORS DETECTED:	0											
FREE CORE:	16546. WORDS											
, DEL: WIR/R: TTN/E: LC=WIR												

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#### Appendix M

##### PEX Module descriptions

There are four modules in PEX. These are:

LUPID	Looks up points in index
PEX	Main point extraction routine
PEXI	PEX initialization routine
SCANDP	Expands compressed signal data

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Module: PEX - main point extraction routine

Language: Macro - 11

Calling Sequence: CALL PEX

External References: Commons

PEXCOM - point extraction common

Item	access	description
XSC	ro	X scan conversion
YSC	ro	Y scan conversion
XPNT	wo	X coordinate of requested point
YPNT	wo	Y coordinate
DBPNTR	wo	Data block pointer
SBLK	r/w	Block where point to be found
SOFFS	ro	Offset of point in block
TWOFFS	ro	Time window offset
TDLY	ro	Total trigger delay

EXDCOM - extracted data common

Item	access	description
DSTAT	ro	Data status, 0=point found
XS	ro	X coordinate of requested point
YS	ro	Y coordinate of requested point
TWDLY	wo	Total windowed delay

External References: Subroutines

name	description
LUPID	Looks up points in index.
SCANDP	Expands data of requested point.

Functional Description:

PEX attempts to extract the data for a single point in the X/Y plane of a recorded scan. If the point is not found but is within the scan, PEX will return with DSTAT = 1. If the point is outside of the scan limits, PEX will return with DSTAT = -1. If the point is found, PEX will return with DSTAT = 0. The requested data will be in IBUF and TWDLY, STARTX and STOPX will contain updated values.

Module: LUPID - Looks up points in index.

Language: Macro - 11

Called BY: PEX

Calling Sequence: CALL LUPID

External References: commons

PEXCOM - Point extraction common

Item	access	description
XPNT	ro	X coordinate to be found
YPNT	ro	Y coordinate
SBLK	wo	Block number of point
SOFFS	wo	Offset of point in block
COB	r/w	Current index block number
INDCH	ro	Channel number of index file
NIB	ro	Number of index blocks
IBLIM	ro	Index to index
IRS	r/w	Current index block (if any)

EXDCOM - extracted data common

Item	access	description
DSTAT	wo	Data status
XLIM1	ro	Limits of recorded scan
YLIM1	ro	
XLIM2	ro	
YLIM2	ro	

External References: Files/LUNS

LUN	actions	description
ICHNUM	r	Index file

Functional Description:

LUPID searches IBLIM to determine which index block contains the requested point. If the needed index block is not already in memory, it is loaded into IRS. The index block is then searched to find the requested point. If the point is present in the index, DSTAT is cleared and the block number and offset of the point are returned in SBLK and SOFFS. If the requested point is determined to be absent from the index, DSTAT is set to a non-zero value and control is returned to the calling routine.

Module: PEXI - Point extraction initialization

Language: Macro - 11

Calling Sequence: CALL PEXI

External References: Commons

PEXCOM - Point extraction common

Item	access	description
XSC	wo	X scan conversion
YSC	wo	Y scan conversion
DFBC	wo	Data file block count
DCHNUM	ro	Data file channel number
CIB	wo	Current index block number
INDCH	ro	Index file channel number
IH	r/w	Index header
FB	ro*	File block for data file(in IH)
XLIM1	ro*	Limits of recorded scan (in IH)
YLIM1	ro*	
XLIM1	ro*	
YLIM2	ro*	
IRNG	ro*	Sample rate range (in IH)

\*Items marked ro in the IH buffer are read from disk but are not modified thereafter.

EXDCOM - extracted data common

Item	access	description
STYP	wo	Scan type
DSTAT	wo	Data status
FUPS	wo	Fundamental units (of time) per sample (in tens of nanoseconds)
SINCR	wo	Scan increment
HXS	wo	High X value of scan
HYS	wo	High Y value of scan

External References: Files/LUNS

LUN	actions	description
INDCH	r	Index file
DCHNUM	o	Data file

Functional Description:

PEXI attempts to read block zero of the file opened on the channel given in INDCH. On read failure, a message is printed on the system console and the program exits. This block is the index header. An attempt is made to open the file specified in the index header on the channel specified by DCHNUM. On open failure, a message is printed on the system console and the program exits. Variables in PEXCOM and EXDCOM are set to initial values. HXS, HYS, FUPS, STYP and SINCR are available to the calling routine and describe the scan in the data file.

Module: SCANDP - expands compressed data

Language: Macro - 11

Calling Routine: PEX

Calling Sequence: CALL SCANDP

External References: Commons

PEXCOM - point extraction common

Item	access	description
XPNT	wo	X coordinate of expanded point
YPNT	wo	Y coordinate
CDB	r/w	Current Data Block
DBPNTR	r/w	Data buffer pointer
SBLK	ro	Requested data block
DCHNUM	ro	Data file channel number
TWOFFS	wo	Time window offset.

EXDCOM - extracted data common

Item	access	description
DSTAT	wo	Data status
STARTX	r/w	Low X value of data
STOPX	wo	End of valid data in IBUF
IBUF	r/w	Expanded data buffer

External References: Files/LUNS

LUN	actions	description
DCHNUM	r	Data file

Functional Description:

SCANDP expands data at indicated block and offset into IBUF. See descriptions of RECQR and SCAND for details.

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Appendix N

PEX Common descriptions

There are two common areas in the PEX subsystem. These are:

EXDCOM	Extracted data common
PEXCOM	PEX system common

Common: EXDCOM - extracted data common

Accessed By: LUPID, PEX, PEXI, SCANDP and application programs

offset	name	description
0	STYP	Scan type: Offset=1, Square=0
2	DSTAT	Data status
4	XS	Requested X coordinate relative to scan origin
6	YS	Requested Y coordinate relative to scan origin
8	TWDLY	Total windowed delay
10	FUPS	Fundamental units (of time) per sample. (The fundamental unit is 10 ns.)
12	SINCR	Scan increment
14	STARTX	Start of data to be processed
16	STOPX	End of data to be processed (relative to IBUF)
18	HXS	High X of scan
20	HYS	High Y of scan
22	Spares(5)	
32	IBUF(2048)	Expanded data buffer (bytes)

Common: PEXCOM - point extraction common  
Accessed By: LUPID, PEX, PEXI, SCANDP

offset	name	description
0	XSC	X scan conversion (offset)
2	YSC	Y scan conversion
4	XPNT	X coordinate relative to scanner origin
6	YPNT	Y coordinate relative to scanner origin
8	DFBC	Data file block count
10	CDB	Current data block number
12	DBPNTR	Data block pointer
14	SBLK	Requested data block
16	SOFFS	Offset of start of requested point
18	DCHNUM	Data file channel number
20	CIB	Current index block in IRS
22	INDCH	Index file channel number
24	TWOFFS	Time window offset
26	Spares(9)	
44	IH(256)	Index header (includes next 256 words)
44	FB(4)	RAD50 fileblock of data file
52	NORP	Number of recorded points
54	NIB	Number of index blocks
56	Spares(3)	
62	XLIM1	Low X limit of scan
64	YLIM1	Low Y limit of scan
66	XLIM2	High X limit of scan
68	YLIM2	High Y limit of scan
70	ZPNT	Z coordinate of scan
72	TDLY	Total trigger delay
74	IUTS	Sample rate units
76	IRNG	Sample rate range
78	INCR	Scan increment
80	OF	Offset scan flag
82	XDCRID(6)	Transducer identification
88	SMPLID(18)	Sample identification
106	IBLIM(5,45)	45 element index of index
556	IRS(256)	Index records
1068	DBUF(2048)	Compressed data buffer (byte)

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Appendix O

PEX Module Listings

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```

1  .TITLE LUPID - LOOK UP POINT IN DIRECTORY
2  .GLOBL LUPID
3  .MCALL .EXIT,...V2,...,RECDEF,SAVE,UNSAVE,.PRINT,.READW,CHTXT
4  .RECDEF
5  ..V2..
6
7  ;
8  ; Upon entry to LUPID, it is assumed that XPNT/YPNT contains the
9  ; encoder reading coordinates of the point to be found. The
10 ; index and data files are assumed to be open and the index
11 ; header to be loaded.
12
13 ; .MLIST TTH
14 ; ST.NUL = -1
15 ; ST.ERR = 012345
16 ; LUPID:
17   MOV #4,R1
18   XPNT,R0
19   R1,R0
20   R0,XPNT
21   SUB R1,R0
22   SUB R1,R0
23   MOV R0,XPNTL
24   MOV YPNT,R0
25   ADD R1,R0
26   MOV R0,YPNT
27   SUB R1,R0
28   SUB R1,R0
29   MOV R0,YPNTL
30   CHECK FOR POINT OUTSIDE OF SCAN LIMITS
31   CHIP XPNTL,MLIH1
32   BLO ERR
33   CHIP YPNTL,MLIH2
34   BHI ERR
35   CHIP YPNTL,YLH1
36   BLO ERR
37   CHIP YPNTL,YLH2
38   BLOS LP2
39   MOV #ST.ERR,ESTAT
40   JHP LPB
41   MOV R1B,R0
42   CHIP R0,#45.
43   BLE 13
44   MOV #45.,R0
45   .PRINT #13C2
46   MOV #1BLH+6,R1
47   CHIP (R1),YPNTL
48   BHS LP3
49   ADD #10.,R1
50   SUB R0,23
51   BR OLPTA
52   CHIP -4ARD,YPNT
53   BHI OLPTA
54   CHIP -4ARD,YPNTL
55   BLO LP4
56   TSTB 24(R1)
57   BNE 25
58   CHIP XPNTL,-6(R1)

```

;GENERATE EXTREME ACCEPTABL VALUES OF X AND Y

;GET # INDEX BLOCKS.  
;IF > 45., USE 45.

;PRINT VARIING.  
;PREPARE TO SEARCH Y HI'S  
;SEARCH FOR YHI >= YPNT.

;POINT NOT IN INDEX.  
;IF YLO > YPNT -  
;POINT NOT IN INDEX.  
;IF YPNT > YLO -  
;GO CHECK HIGH END.  
;CHECK X DIRECTION  
;IF NEGATIVE, SKIP.  
;IF XPNT >= XLO -



```

115 000632      CHXTX      < IN LUPID>,1
116 000636      .WORD      0
117 000659      CHXTX      <INDEX OVER 45. BLOCKS>,1
118 000676      .WORD      0
119 000700      .WORD      0
120 000702      .WORD      0
121 000704      .WORD      0
122 000706      .WORD      0
123 000710      .BLKW      5
124 000710      .CSECT     PEXCOM
125 000660      .WORD      0
126 000662      .WORD      0
127 000664      .WORD      0
128 000666      .WORD      0
129 000670      .WORD      0
130 000672      .WORD      0
131 000674      .WORD      0
132 000676      .WORD      0
133 000678      .WORD      0
134 000680      .WORD      0
135 000682      .WORD      0
136 000684      .WORD      0
137 000686      .WORD      0
138 000688      .WORD      0
139 000690      .WORD      0
140 000692      .WORD      0
141 000694      .WORD      0
142 000696      .WORD      0
143 000698      .WORD      0
144 000700      .WORD      0
145 000702      .WORD      0
146 000704      .WORD      0
147 000706      .WORD      0
148 000708      .WORD      0
149 000710      .WORD      0
150 000712      .WORD      0
151 000714      .WORD      0
152 000716      .WORD      0
153 000718      .WORD      0
154 000720      .WORD      0
155 000722      .WORD      0
156 000724      .WORD      0
157 000726      .WORD      0
158 000728      .WORD      0
159 000730      .WORD      0
160 000732      .WORD      0
161 000734      .WORD      0
162 000736      .WORD      0
163 000738      .WORD      0
164 000740      .WORD      0
165 000742      .WORD      0
166 000744      .WORD      0
167 000746      .WORD      0
168 000748      .WORD      0
169 000750      .WORD      0
170 000752      .WORD      0
171 000754      .WORD      0

```

MSC1A: CHXTX < IN LUPID>,1  
 MSC2: CHXTX <INDEX OVER 45. BLOCKS>,1  
 XPNTL: .WORD 0  
 XPPTH: .WORD 0  
 YPTH: .WORD 0  
 AREA: .BLKW 5  
 .CSECT PEXCOM  
 XSC: .WORD 0  
 YSC: .WORD 0  
 XPHT: .WORD 0  
 YPHT: .WORD 0  
 DFBG: .WORD 0  
 CUB: .WORD 0  
 DEPTR: .WORD 0  
 SELK: .WORD 0  
 SOFTS: .WORD 0  
 DECHUM: .WORD 0  
 CUB: .WORD 0  
 INCH: .WORD 0  
 TWOFFS: .WORD 0  
 SPARES: .BLKW 9  
 IH: .BLKW 4  
 FB: .WORD 0  
 NORP: .WORD 0  
 NIB: .BLKW 3  
 XLIM: .WORD 0  
 YLIM: .WORD 0  
 XLIM2: .WORD 0  
 YLIM2: .WORD 0  
 ZPTH: .WORD 0  
 TOLY: .WORD 0  
 IGCS: .WORD 0  
 IRGC: .WORD 0  
 INCR: .WORD 0  
 OF: .WORD 0  
 XGCRID: .BLKW 6  
 SHPLID: .BLKW 13  
 IBLIN: .BLKW 225  
 IIG: .BLKW 256  
 DBUF: .BLKW 256  
 .CSECT EXDCOM  
 STYP: .WORD 0  
 DSTAT: .WORD 0  
 XS: .WORD 0  
 YS: .WORD 0  
 TABLY: .WORD 0  
 FUPS: .WORD 0  
 SINCR: .WORD 0  
 STARTX: .WORD 0  
 STOPX: .WORD 0  
 HXS: .WORD 0  
 HYS: .WORD 0  
 SPARE: .BLKW 5

;X Scan Conversion  
 ;Y Scan Conversion  
 ;X coordinate relative to scanner origin  
 ;Y coordinate relative to scanner origin  
 ;Data file block count  
 ;Current Data Block #  
 ;Data block pointer  
 ;Requested data block  
 ;Offset of start of requested point  
 ;Data file channel #  
 ;Current index block ( in IRS )  
 ;Index file channel #  
 ;TIME WINDOW OFFSET  
 ;Index Header  
 ;Fileblock  
 ;# of recorded points  
 ;# of index blocks  
 ;low x limit of scan  
 ;low y limit of scan  
 ;high x limit of scan  
 ;high y limit of scan  
 ;Z value of scan  
 ;total trigger delay  
 ;sample rate units  
 ;sample rate range  
 ;scan increment  
 ;offset flag  
 ;SCAN TYPE  
 ;Data Status  
 ;Requested x coordinate relative to scan origin  
 ;Requested Y coordinate relative to scan origin  
 ;Total windowed delay  
 ;Fundamental Units (of time) Per Sample  
 ;Scan increment  
 ;Start of data to be processed  
 ;End of data to be processed (relative to IBUF)  
 ;High X of scan  
 ;High Y of scan  
 ;SPARE COMMON LOCATIONS

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

LUPID - LOOK UP POINT IN DIRECT RT-11 MACRO VM92-12 21-ROV-79 PAGE 1+

172 000040  
173 000001

IBUF: .BLKB 2048. ;Data buffer  
.END

AREA	000710R	CDB	000012R	002	CIB	000024R	002	DEPTR	000014R	002	DBUF	002054R	002
BECHUM	000022R	002	DFBC	000010R	002	DSTAT	000002R	003	ERR	000124R	FB	000054R	002
FUPS	000012R	003	HBS	000022R	003	HYS	000024R	003	IBLIM	000152R	IBUF	000040R	003
HH	000054R	002	HRCR	000116R	002	INDCH	000026R	002	IRGC	000114R	IES	001054R	002
IUTS	000112R	002	LP1	000054R	002	LP2	000136R	002	LP3	000204R	LP4	000254R	002
LLP5	000262R	002	LP6	000316R	002	LP7	000450R	002	LP3	000562R	LUPID	000000R	002
NEG1	000510R	002	NEG1A	000632R	002	NEG2	000650R	002	NIB	000666R	NORP	000064R	002
NUM	000002	002	NUM1	000025	002	OF	000129R	002	OLP7A	000600R	PC	0000097	002
NUM	000000	002	R1	0000001	002	R2	0000002	002	R3	0000003	R4	0000004	002
R5	0000005	002	SBLK	000016R	002	SINCR	000014R	003	SIPLID	000130R	SOFFS	000020R	002
RSP	0000006	003	SPARE	000026R	003	SPARES	000032R	002	STARTX	000016R	STOPX	000020R	003
VP	000000R	002	ST.ERR=	177777	003	ST.NUL=	000001	002	TBLV	000110R	TWDLY	000010R	003
TUOFFS	000030R	002	XDCRID	000122R	002	XLIN1	000076R	002	XLIN2	000102R	XPNT	000004R	002
XPNTL	000702R	002	XPNTL	000700R	002	XS	000004R	003	XSC	000000R	YLIM1	000100R	002
XPNTL	000104R	002	YPNT	000006R	002	YPNTH	000706R	002	YPNTL	000704R	YS	000006R	003

ERRORS DETECTED: 0  
FREE CCR: 16276. WORDS

,DK1:LBP,0/0:TTM/E:LC=LUPID

```

1  .TITLE PEX - POINT EXTRACTION
2  .GLOBL PEX,LUPID,SCANDP
3  .HCALL .REGDEF,SAVE,UNSAVE
4  .REGDEF
5  SAVE 012345
6  MOV XS,XPNT ;GET X POINT
7  ADD XSC,XPNT
8  MOV YS,YPNT ;GET Y POINT
9  ADD YSC,YPNT
10 JSR PC,LUPID ;LOOK UP POINT
11 TST DSTAT ;IF NUL OF ERROR , RETURN
12 BEQ 13
13 13
14 BR 23
15 MOV SBLK,R0 ;CET REQUESTED BLOCK #
16 MOV R0,R1 ;CONVERT TO MULTIPLE OF 4
17 BIC #3,R0
18 XOR R0,R1
19 NOV R0,SBLK
20 SWAB R1
21 ASL R1
22 ADD #DBUF,R1
23 ADD SOFFS,R1
24 MOV R1,SOFFS
25 JSR PC,SCANDP ;GET DATA
26 TDLY,TWDLY ;GET TOTAL WINDOWED DELAY
27 ADD TWOFFS,TWDLY
28 UNSAVE 543210
29 RTS PC
30 .CSECT PEXCON
31 .WORD 0 ;X Scan Conversion
32 .WORD 0 ;Y Scan Conversion
33 .WORD 0 ;X coordinate relative to scanner origin
34 .WORD 0 ;Y coordinate relative to scanner origin
35 .WORD 0 ;Data file block count
36 .WORD 0 ;Current Data Block #
37 .WORD 0 ;Data block pointer
38 .WORD 0 ;Requested data block
39 .WORD 0 ;Offset of start of requested point
40 .WORD 0 ;Data file channel #
41 .WORD 0 ;Current index block ( in IRS )
42 .WORD 0 ;Index file channel #
43 .WORD 0 ;TIME WINDOW OFFSET
44 .BLKW 9.
45 .BLKW 4 ;Index Header
46 .WORD 0 ;Fileblock
47 .WORD 0 ;# of recorded points
48 .BLKW 3 ;# of index blocks
49 .WORD 0 ;low x limit of scan
50 .WORD 0 ;low y limit of scan
51 .WORD 0 ;high X limit of scan
52 .WORD 0 ;high Y limit of scan
53 .WORD 0 ;Z value of scan
54 .WORD 0 ;total trigger delay
55 .WORD 0 ;sample rate units
56 .WORD 0 ;sample rate range
57 .WORD 0 ;scan increment

```

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POORREPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

```

53 000120 000000
59 000122
60 000130
61 000152
62 001054
63 002054
64
65 000000 000000
66 000002 000000
67 000004 000000
68 000006 000000
69 000010 000000
70 000012 000000
71 000014 000000
72 000016 000000
73 000020 000000
74 000022 000000
75 000024 000000
76 000026
77 000040
78 000001

OF: .WORD 0
XOCRID: .BLKB 6
SRPLID: .BLKB 13
IBLIM: .BLKW 225
IRG: .BLKW 256
IBUF: .BLKB 2048
      .CSECT EXDCOM
STYP: .WORD 0
BSTAT: .WORD 0
XS: .WORD 0
YS: .WORD 0
TWLY: .WORD 0
FUPS: .WORD 0
SINCR: .WORD 0
STARTX: .WORD 0
STOPX: .WORD 0
HXS: .WORD 0
HYS: .WORD 0
SPARE: .BLKW 5
IBUF: .BLKB 2048
      .END

;offset flag
;COMPRESSED DATA BUFFER
;SCAN TYPE
;Data Status
;Requested X coordinate relative to scan origin
;Requested Y coordinate relative to scan origin
;Total windowed delay
;Fundamental Units (of time) Per Sample
;Scan Increment
;Start of data to be processed
;End of data to be processed (relative to IBUF)
;High X of scan
;High Y of scan
;SPARE COMMON LOCATIONS
;Data buffer

```

CDB	000012R	002	CIB	000023R	002	DBPNTR	000014R	002	DDUF	002054R	002	DCHNUM	000022R	002
DEBFC	000010R	002	DESTAT	000002R	003	FB	000054R	002	FUPS	000012R	003	HXS	000022R	003
DMX	000024R	003	IBLIM	000015R	002	IBUF	000040R	003	IH	000054R	002	IKCR	000116R	002
IADCH	000026R	002	IRRG	000114R	002	IHS	001054R	002	IOTS	000112R	002	LUPID =	***** G	
IRUB	000066R	002	NORP	000054R	002	OF	000120R	002	PC	=%00007		PEX	000000RG	
RQ	=%000000		RI	=%000001		R2	=%000002		R3	=%000003		R4	=%000004	
R5	=%000005		SBLK	000015R	002	SCANDP=	***** G		SINCR	000014R	003	SHPLID	000130R	002
SP	000020R	002	SP	=%000006		SPARE	000026R		SPARES	000032R	002	STARTX	000016R	003
STOPX	000020R	003	STYP	000000R	003	TDLY	000110R	002	TWDLY	000019R	002	TWOFFS	000030R	002
XDCRID	000122R	002	XLIM1	0000076R	002	XLIM2	000102R	002	XPNT	000004R	002	XS	000004R	003
XSC	000000R	002	YLIM1	000100R	002	YLINE	000104R	002	YPNT	000006R	002	YS	000006R	003
YSC	000002R	002	ZPNT	000106R	002									
. ARES.	000000	000												
PENGOH	000156	001												
EDDGH	000034	002												
004040		003												
EQUOBA) DETECTED: 0														
FREE CORE: 16976. WORDS														

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS

```

1  .TITLE PEXI - PEX INITIALIZATION
2  .GLOBL PEXI
3  .MCALL .REGDEF, .V2, .SAVE, .UNSAVE, .PRINT
4  .MCALL .READW, .LOOKUP, CHTXT, .EXIT
5  .V2...
6  .REGDEF
7  .SAVE 012345
8  .NOV #3, INDC
9  .NOV #2, DCHNUM
10 .CLR CIB
11 .READW #AREA, INDC, #IH, #256, #0
12 .READ BLOCK ZERO (INDEX TO INDEX)
13 .BCC 13
14 .NOVB @#52, R0
15 .ADD @#50, R0
16 .NOV R0, NSC1A
17 .PRINT #NSC1
18 .EXIT
19 .LOOKUP #AREA, DCHNUM, #FB, DFBC
20 .OPEN DATA FILE
21 .BCC 23
22 .NOVB @#52, R0
23 .ADD @#50, R0
24 .NOV R0, NSC2A
25 .PRINT #NSC2
26 .EXIT
27 .NOV XLIN1, YSC
28 .NOV XLIN2, HYS
29 .SUB XLIN1, HYS
30 .NOV YLIN1, YSC
31 .NOV YLIN2, HYS
32 .SUB YLIN1, HYS
33 .CLR ISSTAT
34 .NOV INCR, SINCR
35 .NOV OF, STYP
36 .NOV # -1, CDB
37 .CLR FUPS
38 .NOV INCR, R0
39 .RTBL(R0), FUPS
40 .UNSAVE 543210
41 .RTS PG
42 .BLKW 5
43 .CHTXT <FAILURE ON ATTEMPT TO READ ZERO>, 1
44 .CHTXT < BLOCK OF INDEX. ERROR =>, 1
45 .WORD 0
46 .WORD 0
47 .CHTXT <FAILURE ON ATTEMPT TO OPEN DATA FILE.>, 1
48 .CHTXT <ERROR =>, 1
49 .WORD 0
50 .WORD 0
51 .BYTE 1, 2, 5, 10, 20, 50, 100, 200.
52 .CSECT PEXCON
53 .WORD 0
54 .WORD 0
55 .WORD 0

```

; SELECT CHANNEL #  
 ; SELECT DATA CHANNEL #  
 ; SELECT ZERO INDEX BLOCK  
 ; IF NO ERROR, SKIP  
 ; GET ERROR CODE  
 ; CONVERT TO ASCII  
 ; PUT INTO MESSAGE  
 ; WRITE ERROR ON CONSOLE  
 ; AND QUIT.  
 ; IF NO ERROR, SKIP  
 ; GET ERROR CODE -  
 ; CONVERT -  
 ; AND INSERT.  
 ; GET SCAN CONVERSION  
 ; GET SCAN LIMIT  
 ; GET CONVERSION (Y)  
 ; AND LIMIT.  
 ; SET DATA STATUS TO 'OK'  
 ; GET SCAN INCREMENT  
 ; GET SCAN TYPE  
 ; NO CURRENT DATA BLOCK  
 ; GET TIME UNITS  
 ; X Scan Conversion  
 ; Y Scan Conversion  
 ; X coordinate relative to scanner origin

```

56 000000 000000 YPWT: .WORD 0
57 000010 000000 IFBC: .WORD 0
58 000020 000000 CDB: .WORD 0
59 000030 000000 DBPTR: .WORD 0
60 000040 000000 SBLK: .WORD 0
61 000050 000000 SOFTS: .WORD 0
62 000060 000000 DCHNUM: .WORD 0
63 000070 000000 CIB: .WORD 0
64 000080 000000 INDCH: .WORD 0
65 000090 000000 TWOFFS: .WORD 0
66 000100 000000 SPARES: .BLKW 9
67 000110 000000 IH: .BLKW 4
68 000120 000000 FB: .BLKW 4
69 000130 000000 NORP: .WORD 0
70 000140 000000 NIB: .WORD 0
71 000150 000000 XLIM1: .WORD 0
72 000160 000000 YLIM1: .WORD 0
73 000170 000000 XLIM2: .WORD 0
74 000180 000000 YLIM2: .WORD 0
75 000190 000000 ZPNT: .WORD 0
76 000200 000000 TBLY: .WORD 0
77 000210 000000 LUTS: .WORD 0
78 000220 000000 IRNG: .WORD 0
79 000230 000000 INCR: .WORD 0
80 000240 000000 OF: .WORD 0
81 000250 000000 XDCRID: .BLKB 6
82 000260 000000 SFLID: .BLKB 13
83 000270 000000 IBLIH: .BLKB 225
84 000280 000000 IRS: .BLKW 256
85 000290 000000 DBUF: .BLKB 2043
86 000300 000000 CSECT EXDCOM
87 000310 000000 STYP: .WORD 0
88 000320 000000 RSTAT: .WORD 0
89 000330 000000 XS: .WORD 0
90 000340 000000 YS: .WORD 0
91 000350 000000 TWBLY: .WORD 0
92 000360 000000 FUPG: .WORD 0
93 000370 000000 SINC: .WORD 0
94 000380 000000 STARTX: .WORD 0
95 000390 000000 STGPX: .WORD 0
96 000400 000000 HYS: .WORD 0
97 000410 000000 HYS: .WORD 0
98 000420 000000 SPARE: .BLKW 5
99 000430 000000 IBUF: .BLKB 2043
100 000440 000001 .END

```

;Y coordinate relative to scan origin  
;Data file block count  
;Current Data Block #  
;Data block pointer  
;Requested data block  
;Offset of start of requested point  
;Data file channel #  
;Current index block ( in IRS )  
;Index file channel #  
;TIME WINDOW OFFSET  
;Index leader  
;Fileblock  
;# of recorded points  
;# of index blocks  
;low x limit of scan  
;low y limit of scan  
;high X limit of scan  
;high Y limit of scan  
;Z value of scan  
;total trigger delay  
;sample rate units  
;sample rate range  
;scan increment  
;offset flag  
;SCAN TYPE  
;Data Status  
;Requested x coordinate relative to scan origin  
;Requested Y coordinate relative to scan origin  
;Total windowed delay  
;Fundamental Units (of time) Per Sample  
;Scan increment  
;Start of data to be processed  
;End of data to be processed (relative to IBUF)  
;High X of scan  
;High Y of scan  
;SPARE COMMON LOCATIONS  
;Data buffer

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

AREA	000042R	CDB	000012R	002	CIB	000024R	002	DBPNT	000014R	002	DBUF	000054R	002
BCRUM	000022R	002	DFEC	000010R	002	DSTAT	000022R	003	FB	000054R	002	FUPS	00012R
BES	000022R	003	HYS	000024R	003	IBLH	000152R	002	IBUF	000040R	003	IH	000054R
ICR	000116R	002	INDCH	000026R	002	IRNG	000114R	002	IPS	001054R	002	IUTS	000112R
ISC1	000354R	002	ISC1A	000446R	002	ISC2	000452R	002	ISC2A	000530R	002	IIB	000056R
ISRP	000354R	002	NUH	000002	002	NUH1	000007	002	OF	000120R	002	PC	000000
PEXI	000000R	002	RTBL	000034R	002	R0	000000	002	R1	000001	002	R2	000002
R3	000000	002	R4	000004	002	R5	000005	002	R6	000016R	002	SINCR	000014R
SUPLD	000130R	002	SUFFS	000020R	002	SP	000006	002	SBLK	000026R	003	SPARES	000022R
STARTX	000016R	003	STOPX	000020R	003	STYP	000000R	003	TBL	000110R	002	TADLY	000010R
TWOFFS	000030R	002	XDCRID	000122R	002	XLIN1	000076R	002	XLIN2	000102R	002	XPNT	000004R
XS	000004R	003	XSC	000000R	002	YLIN1	000100R	002	YLIN2	000104R	002	YPNT	000006R
YS	000006R	003	YSC	000002R	002	ZPNT	000106R	002	V2	000001	002		
.ABS.	000000	000											
	000544	001											
PEXCON	000544	002											
ERRCON	000510	003											
ERRORS DETECTED:	0												
FREE CORE:	16200. WORDS												

.BKI:PEXI/R:TTB/E:LC=PEXI

```

1 1 .TITLE SCANDP
2 2 .GLOBL SCANDP
3 3 .RECALL .CLOSE,.RCTRL0,.PRINT,.RECDEF,.READW,.EXIT,...V2...
4 4 .RECALL .SUPTXT,CUTXT,SUPTXT,SAVE,UNSAVE
5 5 .V2...
6 6 .RECDEF
7 7 000000 026767 000012' 000016' SCANDP:
8 8 000000 001492
9 9 000000 004767 000300
10 10 000014 016702 000029' 23:
11 11 000020 010267 000014'
12 12 000024 004767 000272 SIC:
13 13 000030 012203
14 14 000032 001404
15 15 000034 012767
16 16 000042 000207
17 17 000044 012731
18 18 000050 012700
19 19 000054 004767 000242
20 20 000060 012239
21 21 000062 077104
22 22 000064 012704 000049'
23 23 000070 016700 000016'
24 24 000074 001407
25 25 000076 000241
26 26 000100 006000
27 27 000102 103002
28 28 000104 103002
29 29 000110 003024
30 30 000112 077002
31 31 000114 016703
32 32 000120 110324
33 33 000122 004767 SC:
34 34 000126 112201
35 35 000130 073027 000010
36 36 000134 006000
37 37 000136 073027 000003
38 38 000142 006000
39 39 000144 006001
40 40 000146 073127 177775
41 41 000152 001005
42 42 000154 004767 000142
43 43 000160 112201
44 44 000162 042701 177400
45 45 000166 000170 000172'
46 46 000172 000246' 000214' 000212' SCJ:
47 47 000200 000222' 000232' 000240'
48 48 000206 000246'
49 49 000212 000203 SC2:
50 50 000214 110324 SC1:
51 51 000216 077102
52 52 000220 000740
53 53 000222 003303
54 54 000224 110324
55 55 000226 077102
56 56 000230 000734
57 57 000232 000103
58 58 000234 000734
59 59 000236 000734
60 60 000238 000734
61 61 000240 000734
62 62 000242 000734
63 63 000244 000734
64 64 000246 000734
65 65 000248 000734
66 66 000250 000734
67 67 000252 000734
68 68 000254 000734
69 69 000256 000734
70 70 000258 000734
71 71 000260 000734
72 72 000262 000734
73 73 000264 000734
74 74 000266 000734
75 75 000268 000734
76 76 000270 000734
77 77 000272 000734
78 78 000274 000734
79 79 000276 000734
80 80 000278 000734
81 81 000280 000734
82 82 000282 000734
83 83 000284 000734
84 84 000286 000734
85 85 000288 000734
86 86 000290 000734
87 87 000292 000734
88 88 000294 000734
89 89 000296 000734
90 90 000298 000734
91 91 000300 000734
92 92 000302 000734
93 93 000304 000734
94 94 000306 000734
95 95 000308 000734
96 96 000310 000734
97 97 000312 000734
98 98 000314 000734
99 99 000316 000734
100 100 000318 000734
101 101 000320 000734
102 102 000322 000734
103 103 000324 000734
104 104 000326 000734
105 105 000328 000734
106 106 000330 000734
107 107 000332 000734
108 108 000334 000734
109 109 000336 000734
110 110 000338 000734
111 111 000340 000734
112 112 000342 000734
113 113 000344 000734
114 114 000346 000734
115 115 000348 000734
116 116 000350 000734
117 117 000352 000734
118 118 000354 000734
119 119 000356 000734
120 120 000358 000734
121 121 000360 000734
122 122 000362 000734
123 123 000364 000734
124 124 000366 000734
125 125 000368 000734
126 126 000370 000734
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128 128 000374 000734
129 129 000376 000734
130 130 000378 000734
131 131 000380 000734
132 132 000382 000734
133 133 000384 000734
134 134 000386 000734
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136 136 000390 000734
137 137 000392 000734
138 138 000394 000734
139 139 000396 000734
140 140 000398 000734
141 141 000400 000734
142 142 000402 000734
143 143 000404 000734
144 144 000406 000734
145 145 000408 000734
146 146 000410 000734
147 147 000412 000734
148 148 000414 000734
149 149 000416 000734
150 150 000418 000734
151 151 000420 000734
152 152 000422 000734
153 153 000424 000734
154 154 000426 000734
155 155 000428 000734
156 156 000430 000734
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```

56 000234 110324      ; INSERT VALUE
57 000236 000731      ; BOUN COUNT
58 000240 100103      ; INSERT VALUE
59 000242 110324      ; INSERT VALUE
60 000244 000726      ; INSERT VALUE
61 000246
62 000248
63 000250 012700 004040'
64 000252 100400
65 000254 003407
66 000256 000241
67 000260 000000
68 000262 003404
69 000264 103001
70 000266 105024
71 000270 005024
72 000272 077002
73 000274 032702 000001
74 000300 001401
75 000302 005302
76 000304 010267
77 000310 000167
78 000314
79 000320 000405
80 000322 020227 000054'
81 000326 103505
82 000330
83 000334
84 000404 103044
85 000406 105737 000052
86 000412 001433
87 000414
88 000416
89 000424
90 000426
91 000466 000
92
93 000470
94 000502
95 000504
96 000506 000006
97 000512 177316
98 000516 012767 000014'
99 000524 016767 000016' 000012'
100 000532 016702 000014'
101 000536
102 000542
103 000544 000004' 000005' 000016' THERE:
104 000550 000020' 000030' 000050'
105 000560
106 000562
107 000600
108 000602
109 000604
110 000606
111 000610

```

; GET END OF BUFFER  
 ; COMPUTE NUMBER OF VALUES  
 ; CLEAR WORD  
 ; GO AGAIN  
 ; CHECK ODD ADDRESS  
 ; IF NOT, SKIP  
 ; SKIP ONE BYTE BACK (EOR IS 1 BYTE IF ODD ADDRESS)  
 ; UPDATE POINTER  
 ; CHECK FOR END OF BUFFER  
 ; IF NOT, RETURN  
 ; AREA, DCIRUM, DBUF, #1024, SBLK  
 ; IF NO ERROR ON READ GO TO RD4  
 ; FIND OUT WHICH ERROR  
 ; IF ZERO, EOF  
 ; IF NOT ZERO, ERROR  
 ; WRITE MESSAGE ON CONSOLE  
 ; END EXIT  
 < CHANNEL ERROR ON READ - EXITING >, 1  
 . BYTE 0  
 . BLKW 5  
 . TST R9  
 . BNE RD4  
 . ADD #6, SP  
 . JHP S2C  
 ; SKIP SAVED REGISTERS AND SAVED ADDRESSES  
 ; RETURN TO HRS  
 ; RESET TO TOP OF BUFFER  
 ; UPDATE CURRENT DATA BLOCK  
 ; GET NEW POINTER  
 ; RETURN TO SCAND  
 ; X Scan Conversion  
 ; Y Scan Conversion  
 ; X coordinate relative to scanner origin  
 ; Y coordinate relative to scanner origin  
 ; Data file block count

```

112 000012 000000 CDB: .WORD 0
113 000014 000000 DBPTR: .WORD 0
114 000016 000000 SBLK: .WORD 0
115 000020 000000 SOFFS: .WORD 0
116 000022 000000 DCHRUH: .WORD 0
117 000024 000000 CFB: .WORD 0
118 000026 000000 INCH: .WORD 0
119 000030 000000 TBOFFS: .WORD 0
120 000032 000000 SPARES: .BLKW 9.
121 000034 .BLKW 4
122 000036 000000 FB: .BLKW 4
123 000038 000000 RORP: .WORD 0
124 000040 000000 NIB: .WORD 0
125 000042 000000 .BLKW 3
126 000044 000000 XLIM: .WORD 0
127 000046 000000 YLIM: .WORD 0
128 000048 000000 XLH2: .WORD 0
129 000050 000000 YLH2: .WORD 0
130 000052 000000 ZPRT: .WORD 0
131 000054 000000 TPLY: .WORD 0
132 000056 000000 LOTS: .WORD 0
133 000058 000000 IRGC: .WORD 0
134 000060 000000 INCR: .WORD 0
135 000062 000000 OF: .WORD 0
136 000064 000000 XDCRID: .BLKB 6
137 000066 000000 SHPLID: .BLKB 18.
138 000068 000000 IBLIM: .BLKW 225.
139 000070 000000 IRS: .BLKW 256.
140 000072 000000 DBUF: .BLKB 2048.
141 000074 000000 .CSECT ENDCOM
142 000076 000000 STYP: .WORD 0
143 000078 000000 ISTAT: .WORD 0
144 000080 000000 YS: .WORD 0
145 000082 000000 YS: .WORD 0
146 000084 000000 TPLY: .WORD 0
147 000086 000000 FURS: .WORD 0
148 000088 000000 SINC: .WORD 0
149 000090 000000 STARTX: .WORD 0
150 000092 000000 STOPX: .WORD 0
151 000094 000000 IRS: .WORD 0
152 000096 000000 HYS: .WORD 0
153 000098 000000 SPARE: .BLKW 5
154 000100 000000 IBUF: .BLKB 2048.
155 000102 000000 .END

```

;Current Data Block #  
;Data block pointer  
;Requested data block  
;Offset of start of requested point  
;Data file channel #  
;Current index block ( in IRS )  
;Index file channel #  
;TIME WINDOW OFFSET  
;Index Header  
;File block  
;# of recorded points  
;# of index blocks  
;low x limit of scan  
;low y limit of scan  
;high X limit of scan  
;high Y limit of scan  
;Z value of scan  
;total trigger delay  
;sample rate units  
;sample rate range  
;scan increment  
;offset flag  
;COMPRESSED DATA BUFFER  
;SCAN TYPE  
;Data Status  
;Requested x coordinate relative to scan origin  
;Requested Y coordinate relative to scan origin  
;Total windowed delay  
;Fundamental Units (of time) Per Sample  
;Scan increment  
;Start of data to be processed  
;End of data to be processed (relative to IBUF)  
;High X of scan  
;High Y of scan  
;SPARE COMMON LOCATIONS  
;Data buffer

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



Appendix P

Utilities

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

BTXT:

When the BATCH job BTXT.BAT is run, all files on the system device with the extension ".LST" are listed on the console terminal and are then deleted. To run BTXT, use the following string of commands:

.LOA BA

.LOA KB

.ASS KB:LOG

.R BATCH

\*BTXT

<local form feed>

While BATCH is running, any key pressed on the console terminal will cause the BATCH handler to hang. Control C should be used to abort the BATCH job and return to the monitor. BTXT uses the files LST.SAV and PIP.SAV which must be present. Temporary files named Q, Q.BAT and Q.CTL are created and deleted.

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

FF:

The utility program FF.SAV is used to output listings which contain form feed characters on terminals which do not provide form feed capability. Each form feed is replaced with the equivalent number of line feed and fill characters.

Example:

.R FF

\*TT:=A

(Position to top of form before pressing return)

The above command string will list the file 'A.LST' on the console terminal - substituting multiple line feeds for form feeds.

SWISH:

SWISH provides the capability to transfer files between the 11/45 system and the LSI-11 system. SWISH uses the command string interpreter to process standard command strings.

1. On the computer to which the file is to be sent:

.R SWISH

\*DEV:NNNNNN.XXX=

2. On the computer from which the file is to be sent:

.R SWISH

\*DEV:NNNNNN.XXX

3. When transfer is complete, SWISH will prompt for next command.

4. Default extensions are ".MAC" and default device is SY!.

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TITLE SWISH  
SWISH -

INTERPROCESSOR FILE TRANSFER UTILI

P. L. Hammond 5-Jul.-79

SWISH utilizes the command string interpreter for input of filenames. In accordance with standard use, when only an input (from the disk) file is specified in a command string, it appears alone. When only an output file is specified in a command string, it is followed by an equal sign (=).

To use SWISH, the following procedure should be followed:

1. On the computer to which the file is to be copied, the command string:

DEV:NNNNNN.XXX=

should be entered.

2. On the computer from which the file is to be copied, the command string:

DEV:NNNNNN.XXX

should be entered.

3. When transfer is complete, SWISH will prompt for next command.

4. Default extensions are ".HAC".

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

P-4

1	000120	012705	000626	REL:	MOV	#LIST,R5	;SETUP TO READ FROM DISK
2	000124			READ:	.READW	R5,#3,#IBUF,#256	;READ FROM FILE
3	000172	103932			BCC	PROCES	;IF NO ERROR, GO PROCESS DATA
4	000174	103737	000052		TSTB	@#ERRWD	;CHECK FOR EOF
5	000200	001405			BEQ	EOF	;EOF
6	000202	012700	001642		MOV	#INERR,R0	;INPUT ERROR
7	000206			ERRROUT:	.PRINT		;PRINT ERROR MESSAGE
8	000210	005000			CLR	R0	;HARD ERROR: EXIT
9	000212				.EXIT		;ON END OF FILE, SEND STATUS OF ONE
10	000214	012767	177777	EOF:	MOV	#-1,STATUS	;SEND STATUS AND BUFFER
11	000222	004767	000044		JSR	PC,CN6	;CLOSE OUTPUT FILE
12	000226				.CLOSE	#0	;CLOSE INPUT FILE
13	000240				.CLOSE	#3	;RESET SYSTEM
14	000252				.SRESET		;SET NEXT COMMAND STRING
15	000254	000167	177520		JMP	SWISH	;SEND STATUS AND IBUF TO OTHER COMPUTER
16	000260	004767	000005	PROCES:	JSR	PC,CN6	;INCREMENT BLOCK COUNT
17	000264	005267	000332		INC	INBLK	;READ NEXT BLOCK
18	000270	000715			BR	READ	;INTERNAL SUBROUTINE TO SEND BLOCKS ACROSS INTERFACE
19					CN6-		;SAVE REGISTERS
20	000272				SAVE	12	;SEND 257 WORDS
21	000276	012701	000401		MOV	#257.,R1	;SET BEGINNING OF BLOCK TO BE SENT
22	000302	012702	000640		MOV	#STATUS,R2	;SEND WORD
23	000306	012237	167742	35:	MOV	(R2)+,@#VREG	;INTERPROCESSOR INTERRUPT
24	000312	052737	000092		BIS	#2,@#CSR	;WAIT FOR ACKNOWLEDGE
25	000320	105737	167740	13:	TSTB	@#CSR	
26	000324	002375			BCE	15	
27	000326	042737	000002		BIC	#2,@#CSR	;CLEAR INTERRUPT
28	000334	105737	167740	25:	TSTB	@#CSR	;WAIT FOR CLEAR
29	000340	092775			BLT	25	
30	000342	077117			SOB	R1,33	;REPEAT
31	000344				UNSAVE	21	
32	000350	000207			RTS	PC	

REPRODUCIBILITY OF THE  
ORIGINAL P

```

1 000352      103650      000050      167740      WRITE:      .WAIT      #0
2 000364      052737      000050      167740      WR:      BCS      #FERR
3 000366      052737      000050      167740      13:      BIS      #40.,@#CSR
4 000374      005767      000224      000224      TST      INFLG
5 000380      001775      000232      000232      BEQ      13
6 000402      005767      000232      000232      TST      STATUS
7 000406      002010      000232      000232      BCC      23
8 000410      000410      000232      000232      .CLOSE      #0
9 000422      000167      177350      000167      .SRESET
10 000424      000167      177350      000167      JMP      SWISH
11 000430      005067      000170      000170      INFLG
12 000434      012705      000626      000626      CLR      #LIST,R5
13 000440      000440      000626      000626      MOV      #LIST,R5
14 000504      103003      001656      001656      .WRITE      #5.,#0,#IBUF,#256.,IBLK
15 000506      012700      001656      001656      BCC      #FERR
16 000512      000635      000635      000635      MOV      #WERR,R0
17 000514      005267      000102      000102      BR      ERROUT
18 000520      000722      000722      000722      INC      INBLK
19 000522      012702      167740      167740      WR      INBLK
20 000522      012702      167740      167740      INT:      #FERR
21 000530      042712      000040      000040      L3INT:      SAVE      012
22 000534      042712      000040      000040      MOV      #CSR,R2
23 000538      012700      000401      000401      BIC      #40,(R2)
24 000544      012701      000640      000640      MOV      #257.,R0
25 000550      005712      000712      000712      MOV      #STATUS,R1
26 000552      002376      002376      002376      TST      (R2)
27 000554      013721      167744      167744      BCC      13
28 000560      052712      000001      000001      MOV      @#RREG,(R1)+
29 000564      005712      000001      000001      BIS      #1,(R2)
30 000566      002776      000001      000001      TST      (R2)
31 000570      042712      000001      000001      BLT      23
32 000574      077013      000001      000001      BIC      #1,(R2)
33 000576      005267      000022      000022      SOB      R0,13
34 000602      000002      000002      000002      INC      INFLG
35 000610      000002      000002      000002      UNSAVE      210
RTI

```

	DEFEXT:	.RAD50	"MAC"
1	000612	.RAD50	"MAC"
2	000614	.RAD50	"MAC"
3	000616	.RAD50	"MAC"
4	000620	.RAD50	"MAC"
5	000622	.WORD	0
6	000624	.WORD	0
7	000626	.BLKW	5
8	000640	.WORD	0
9	000642	.BLKW	256.
10	001642	.ASCIZ	/INPUT ERROR/
11		.EVEN	
12	001656	.ASCIZ	/OUTPUT ERROR/
13		.EVEN	
14	001674	.ASCIZ	/ONLY ONE FILE IS NEEDED/
15		.EVEN	
16	001724	.ASCIZ	/NO FILE/
17	001734	.BLKW	4000.
18		.END	SWISH

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CH5	000272R	CSR	= 167740	DEFEXT	000612R	EOF	000214R	ERROUT	000206R
ERRAD =	000052	ERR0	001724R	ERR2	001674R	IBUF	000642R	IBBLK	000622R
ERRR	001642R	IFLAG	000624R	IVADR =	000344	IVSTAT=	000346	LIST	000626R
LSINT	000522R	NFERR	000106R	NOERR	000514R	PC	=%000007	PROCES	000260R
READ	000124R	RE1	000120R	ROOM	001734R	RREG	= 167744	R0	=%000000
R1	=%009001	R2	=%000002	R3	=%000003	R4	=%000004	R5	=%000005
SP	=%000006	STATUS	000640R	SWISH	000000R	TFERR	000074R	WR	000366R
WREC	= 167742	WRITE	000352R	WRI	000434R	WTERR	001656R	...V2 =	000001

. AES. 000000 990  
C21434 001

ERRORS DETECTED: 0  
FREE CORE: 16233. WORDS

,DK1:SWISH/H:TTI/E:LC=SWISH

# Appendix Q

## Pulser Unit Connections and Front Panel Settings

For proper system operation, the ultrasonic pulser (MetroTek MP-203) and receiver (MetroTek MR-101) as well as the associated pulse conditioner (Tektronix PG-501) must be connected correctly. Appropriate front panel settings must also be applied. The following cable connections should be made:

unit	FROM connector	unit	TO connector
LSI-11	rightmost	PG-501	Trig/Duration In (upper)
PG-501	Trig out (upper)	MP-203	Ext. Trig
MP-203	Pulse Out	Xducer	Top of search rod
MP-203	Pulse Out	MR-101	Transmit
MR-101	Scope	Scope	Input A
MR-101	Scope	B-8100	Channel A+ input

These front panel settings should be used:

unit	control	Range/settings	Adjust to-
PG-501	Period	Ext. Trigger	
	Duration	2 micro s.	
	Amplitude Out		4v
MP-203	Trigger	external	
	Pulse Amplitude		variable
	Damping		variable
	Pulse Width		variable
MR-101	Function	Pulse/Echo	
	Attenuation	1dB	
	Filter	0.5 Mhz.	

Note: Refer to operation manual of each unit for details.

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